

5252A PRESCALER

OPERATING AND SERVICE MANUAL



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OPERATING AND SERVICE MANUAL

MODEL 5252A PRESCALER

SERIALS PREFIXED: 513-, 532-

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1501 PAGE MILL ROAD, PALO ALTO, CALIFORNIA, U.S.A.

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Figure 1-1. Model 5252A and Accessories

SECTION I
GENERAL

1-1. INTRODUCTION.

1-2. DESCRIPTION.

1-3. The Hewlett-Packard Model 5252A Prescaler Unit is a plug-in unit which converts the Hewlett-Packard Model 5245L Electronic Counter* into a direct reading counter from DC to 350 Mc. Prescaling is accomplished, without tuning, by transistor binary dividers, operating over the frequency range DC to 350 Mc. Multiple scaling factors (2, 4, or 8) are provided to shorten scaling time at the lower frequencies.

1-4. The Model 5252A operates by electronically scaling the input frequency, at the same time extending the counter's time base an equal amount to provide the operator with a direct readout of the input frequency. A LEVEL adjustment permits counting of either positive or negative random pulses. A front panel switch allows selection of a scale factor of 2, 4, or 8 that optimizes the amount the gate time (controlled by the time base) is extended for a given frequency input. Multiple scale factors allow measurements at lower frequencies to be made without unduly extending the gate time, while providing full capability for direct readout at higher frequencies. For example, the multiplying factor of 8 required when measuring frequencies near 350 Mc is not necessary for measurements below 200 Mc; hence, multiple scale factors allow the operator to make lower frequency measurements in less time.

1-5. Three scale positions are provided. With the selector switch in the 100 Mc position the frequency range is DC to 100 Mc (scale factor of two); with the switch in the 200 Mc position, the range is DC to 200 Mc (scale factor of four); and with the switch in the 350 Mc position the range is DC to 350 Mc (scale factor of eight). The scaled input frequency is available at the AUX A output connector on the counter rear panel.

1-6. SPECIFICATIONS.

1-7. Table 1-1 contains all technical specifications for the Model 5252A when operated in the Model 5245L Electronic Counter. Values and measurements provided in other sections of the manual to assist the operator or technician do not constitute additional specifications.

1-8. INSTRUMENT IDENTIFICATION.

1-9. Hewlett-Packard uses a two-section, eight-digit serial number to identify instruments. The serial number is located on a serial plate on the rear frame of the Model 5252A. The first three digits are a serial

prefix number which identifies the instrument with respect to changes made during manufacture. The last five digits refer to a specific instrument. If the first three digits of your instrument serial number do not appear on the title page of this manual, there are differences between the manual and your instrument. These differences are described in a change sheet included with the manual. If the change sheet is missing, the information can be supplied by your nearest Hewlett-Packard field office.

1-10. ACCESSORY SUPPLIED.

1-11. A 50-ohm coaxial cable (Ⓢ Part No. 10503-6001) 48 inches long, male BNC to male BNC, is furnished with the Model 5252A.

1-12. ACCESSORIES AVAILABLE.

1-13. A fifty-conductor extender cable (Ⓢ Part No. 10506B) is available from Hewlett-Packard. This cable provides interconnections between the Counter jack and the Prescaler mating plug when the Prescaler is outside the plug-in compartment.

Table 1-1. Specifications**

OPERATING FREQUENCY RANGE: DC to 350 Mc.
ACCURACY: Same as the basic counter.
INPUT SENSITIVITY: 100 mv RMS.
MAXIMUM INPUT: 2 volts rms, ±20 dbm, or 100 mw.
INPUT IMPEDANCE: 50 ohm (nominal).
OPERATING TEMPERATURE RANGE: 0°C to +55°C.
SCALED OUTPUT: > 100 mv RMS into 50 ohms is available at the AUX A output BNC connector of the basic counter.
DOUBLE PULSE RESOLUTION: 2.8 ns.
PULSE AMPLITUDE: 280 mv.

* Counters serial prefixed 335 and below must be modified. Ⓢ modification kit Part No. 05243-6030.

**When used with the Hewlett-Packard Model 5245L, 50 Mc Electronic Counter serial prefixed 402 and above.

SECTION II INSTALLATION

2-1. INTRODUCTION.

2-2. This section contains information on unpacking, inspection, repacking, storage, and installation.

2-3. UNPACKING AND INSPECTION.

2-4. If the shipping carton is damaged, ask that the carrier's agent be present when the instrument is unpacked. Inspect the instrument for damage (scratches, dents, broken knobs, etc). If the instrument is damaged or fails to meet specifications (Performance Check, Table 5-3), notify the carrier and the nearest Hewlett-Packard field office immediately (field offices are listed at the back of this manual). Retain the shipping carton and the padding material for the carrier's inspection. The field office will arrange for the repair or replacement of your instrument without waiting for the claim against the carrier to be settled.

2-5. STORAGE AND SHIPMENT.

2-6. **PACKAGING.** To protect valuable electronic equipment during storage or shipment always use the best packaging methods available. Your Hewlett-Packard field office can provide packing material such as that used for original factory packaging. Contract packaging companies in many cities can provide dependable custom packaging on short notice. Here are a few recommended packaging methods.

a. **RUBBERIZED HAIR.** Cover painted surfaces of instrument with protective wrapping paper. Pack instrument securely in strong corrugated container (350 lb/sq in. bursting test) with 2-inch rubberized hair pads placed along all surfaces of the instrument. Insert fillers between pads and container to ensure a snug fit. Mark the box "DELICATE INSTRUMENT" and seal with strong tape or metal bands.

b. **EXCELSIOR.** Cover painted surfaces of instrument with protective wrapping paper. Pack instrument in strong corrugated container (350 lb/sq in. bursting test) with a layer of excelsior about 6 inches thick packed firmly against all surfaces of the instrument. Mark the box "DELICATE INSTRUMENT" and seal with strong tape or metal bands.

2-7. **ENVIRONMENT.** Conditions during storage and shipment should normally be limited as follows:

a. Maximum altitude 20,000 feet.

b. Minimum temperature -40°F (-40°C).

c. Maximum temperature 167°F (75°C).

CAUTION

TURN COUNTER POWER OFF BEFORE INSTALLING OR REMOVING PRESCALER UNIT.

2-8. INSTALLATION.

2-9. The Model 5252A plugs into the rectangular compartment at the right hand side of the front panel of the Model 5245L Electronic Counter. To install unit in counter, turn counter off and remove blank panel from counter by turning the retaining latch knob counterclockwise. Insert Prescaler Unit into counter and push unit firmly into compartment until front panel of plug-in is flush with the front panel of the counter. Turn the retaining latch knob clockwise until it is tight.

2-10. To remove unit from counter, turn counter off and turn the retaining latch knob counterclockwise to its stop. Then grasp switch knob and pull unit from counter. If any difficulty is encountered with installation or removal, check that the retaining latch is fully counterclockwise.

2-11. COOLING.


2-12. The Model 5252A is cooled by the ventilation system of the counter in which it is installed. See operating and service manual of counter for cooling system maintenance instructions.

2-13. POWER REQUIREMENTS.

2-14. All electrical power required to operate the Model 5252A is supplied by the counter in which the unit is installed.

2-15 ELECTRICAL CONNECTIONS.

2-16. The INPUT connector on the front panel of the plug-in (see Figure 3-1) is the only external electrical connection to the plug-in. All other connections are made through the 50-pin connector (P6) at the rear of the plug-in when the unit is installed in the counter*.

* 5245L Counters with serial prefix 335 and below must be modified with  modification kit Part No. 05243-6030.

SECTION III OPERATION

3-1. CONTROLS AND INPUT.

3-2. GENERAL. The function of the front panel switch, connector, and control are shown in Figure 3-1.

3-3. MAX COUNT RATE SWITCH. The switch selects scaling factor for the unknown frequencies. The following are the switch positions and their corresponding scaling factors.

MAX COUNT RATE	SCALE FACTOR
100 Mc	2
200 Mc	4
350 Mc	8

3-4. INPUT CONNECTOR. The signal input is DC coupled into 50 ohms. Damage to the plug-in will

result if a dc voltage or ac signal greater than 2 v rms, +20 dbm, or 100 mw is applied to the plug-in INPUT connector.

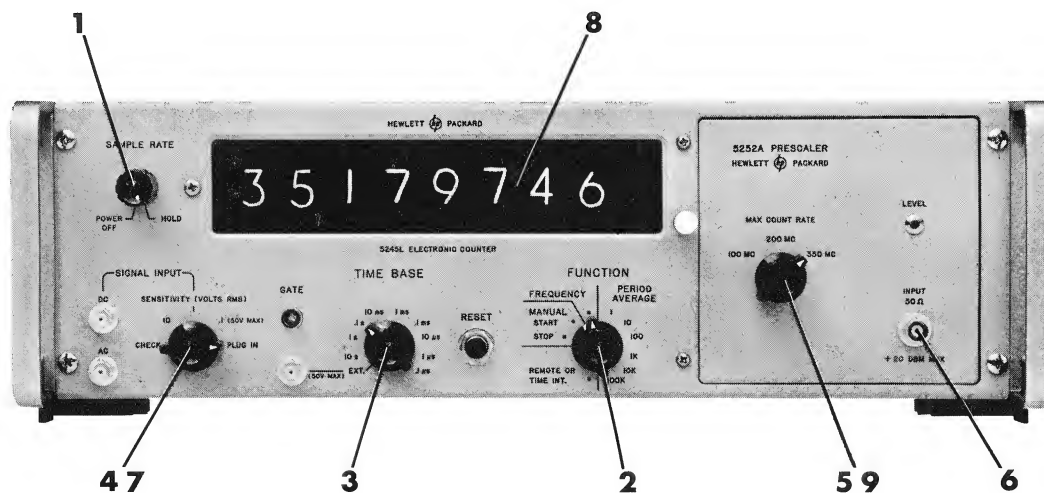
3-5. LEVEL CONTROL. Provides adjustment for counting either positive or negative pulses. See Paragraph 5-11 for adjustment procedure.

3-6. OPERATING PROCEDURE.

3-7. Figure 3-1 provides a step-by-step procedure for operating the 5252A plug-in.

3-8. SCALED OUTPUT.

3-9. A scaled output of greater than 100 mw RMS into 50 ohms is available at the AUX A jack on the rear panel of the counter.



1. Turn counter on with SAMPLE RATE control.
2. Set FUNCTION switch to FREQUENCY.
3. Set TIME BASE switch to desired gate time*.
4. Set SENSITIVITY switch to CHECK to verify proper counter operation.
5. Set plug-in MAX COUNT RATE switch to 350 Mc.
6. Connect unknown signal to plug-in INPUT jack.
7. Set SENSITIVITY switch to PLUG-IN.
8. Display is unknown frequency.
9. For faster gate times, the MAX COUNT RATE switch may be set to lower frequency range which includes unknown frequency.

CAUTION

Input signal must not have any dc voltage and ac signal must not exceed 2 v rms, +20 dbm, or 100 mw.

* Gate time is extended by 2:1 when count rate is on 100 Mc; 4:1 when count rate is on 200 Mc, and 8:1 when count rate is on 350 Mc.

Figure 3-1. Frequency Measurement

SECTION IV

PRINCIPLES OF OPERATION

4-1. INTRODUCTION.

4-2. The prescaler consists of a prescaler assembly and a time base divider assembly. Tunnel diodes used in the prescaler assembly are described in Paragraphs 4-4 and 4-5. Operation of the prescaler assembly is discussed in Paragraphs 4-7 and 4-8. Time base divider assembly operation is discussed in Paragraphs 4-9 through 4-14.

4-3. TUNNEL DIODES

4-4. The tunnel diode is a pn junction with the junction depletion region made very thin. The device is essentially in a "reverse breakdown" condition even when a small forward bias is applied. As the bias is increased, there is an increase in current, up to a point (see Figure 4-1). As the reverse breakdown condition is neutralized, the diode's current decreases with increasing voltage until a minimum point is reached. Beyond this point, the tunnel diode behaves much like a conventional diode. A decrease in current with increasing voltage is the basic characteristic of a negative resistance (as distinguished from a "positive" resistance, in which current increases as applied voltage is increased).

4-5. Tunnel diodes are used as a trigger and as part of a pulse shaper. Figure 4-1 shows the characteristic curve of a tunnel diode and the load line shift during operation. Figure 4-1 also shows a basic trigger circuit and corresponding waveforms.

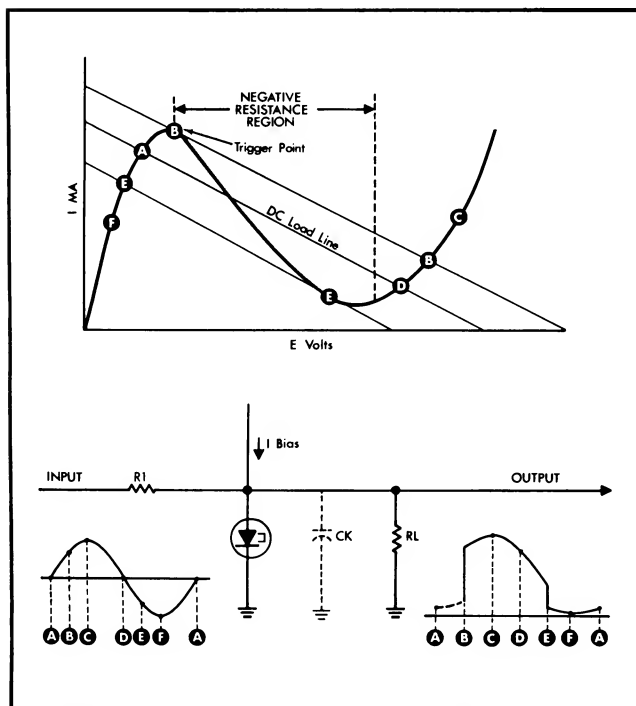


Figure 4-1. Tunnel Diode Characteristics

4-6. PRESCALER ASSEMBLY A1.

4-7. GENERAL.

4-8. The prescaler assembly scales the input signal by a factor of 2, 4, or 8. The scale factor is selected by the MAX COUNT RATE switch. See logic diagram Figure 5-3 and schematic diagram Figure 5-4 for circuit details.

4-9. SIGNAL FLOW.

4-10. The input signal to the prescaler is controlled by the input limiter CR1-CR4. When the signal is a positive going signal the current flow is through CR2. A negative going signal results in a current flow through CR4. Q2 is turned on on the positive going slope of the input signal. The output from Q2 fires tunnel diode trigger CR5. The square wave from the trigger is amplified by Q1 trigger amplifier and differentiated by R13, L3. The differentiated pulse is shaped and the positive pulses clipped by the pulse shaper CR6, R16, and L4. The negative pulse is amplified and inverted by Q5 and Q6 to drive binary A. Binary A has a constant current source from R24 and R25 of 12 ma. If Q11 is on, it is conducting 10 ma while R8 is conducting 2 ma. Q9 is conducting 12 ma and Q10 is cut off. When a positive pulse is applied to the binary, Q11 is cut off; Q8 conducts 12 ma, amplifies it, and turns on Q10. Q10 conducts 10 ma and Q9 current drops to 2 ma keeping Q11 cut off until the next pulse. The signal from the binary goes to the output amplifier Q12. The output of Q12 is differentiated and drives pulse amplifier Q13-Q14 which drives the next binary state. The next pulse reverses the conducting state of Binary A. The output of the binary goes to the output amplifier Q7. If the signal goes to Q7 and the control voltage is applied to "AND" gate CR8 (MAX COUNT RATE switch in 100 ma position), the scaled signal will go directly to the 50 Mc drive amplifier, Q25-Q26. The output of the 50 Mc amplifier goes to the signal input of the counter and to the AUX A jack on the rear of the counter.

4-11. TIME BASE DIVIDER ASSEMBLY A2.

4-12. GENERAL.

4-13. The time base divider assembly delays the gate trigger signal to the counter gate control by delaying the stop signal to the main counter gate. This is done by multiplying the period of the gate triggering signal from the counter by a factor of 2, 4, or 8 as selected by the MAX COUNT RATE switch. The result is a direct readout of the measured frequency.

4-14. SIGNAL FLOW.

4-15. 350 Mc Range. In the 350 Mc function the following sequence occurs (see Figures 4-2 and 5-5). The reset pulse from the counter sets the binaries so Q5, Q7 and Q9 are conducting. The gate triggering

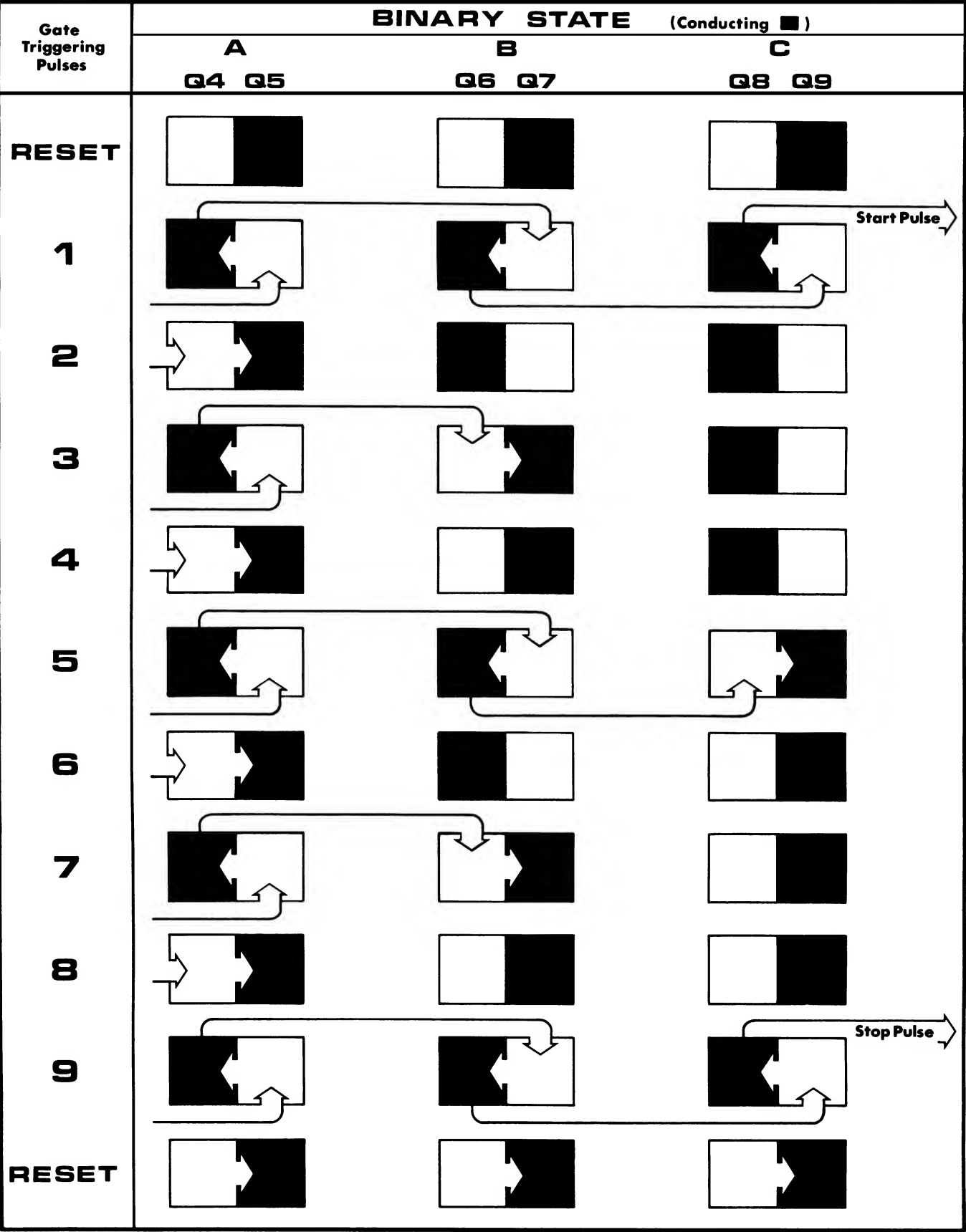


Figure 4-2. Divider Sequence (Scale Factor 8)

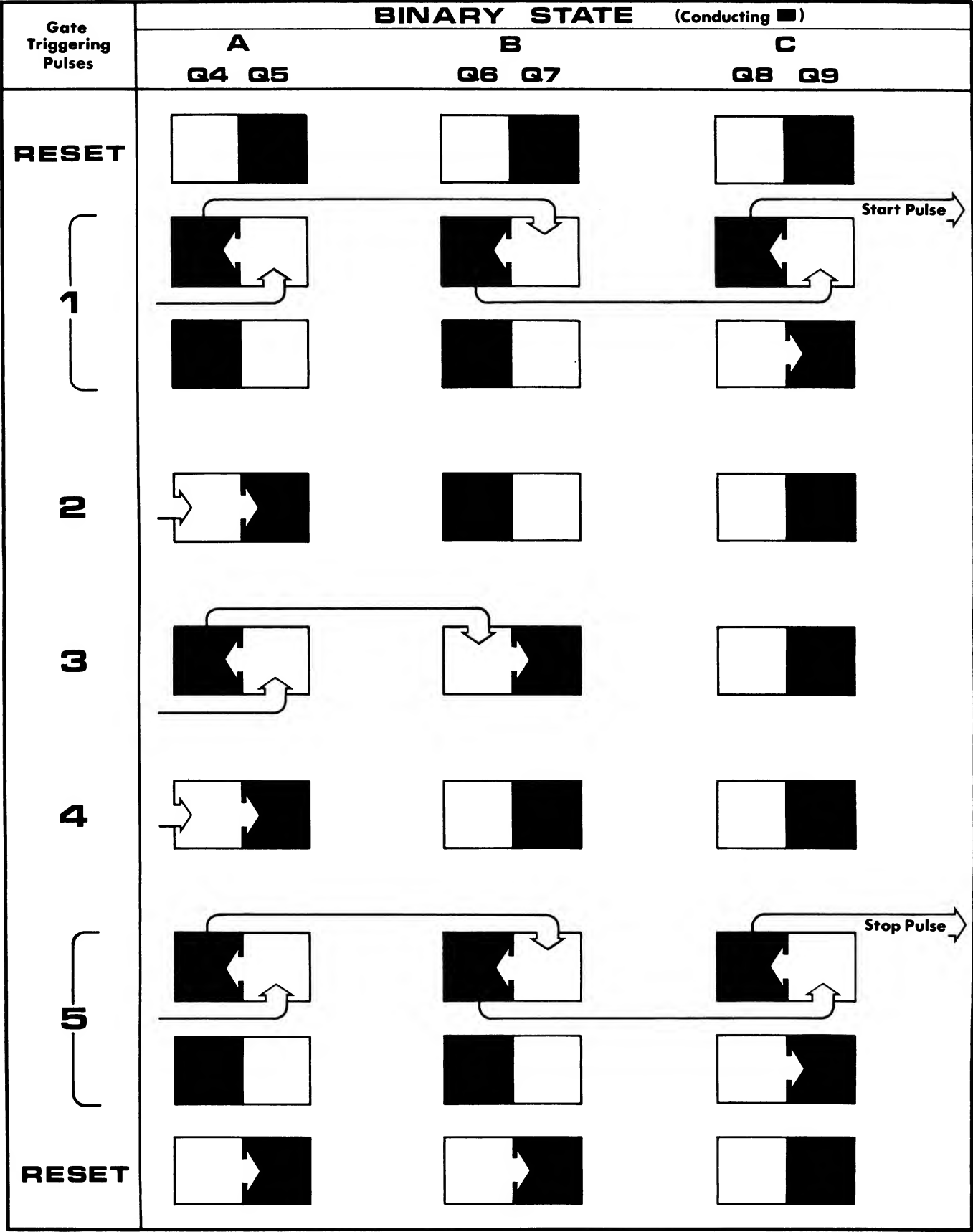


Figure 4-3. Divider Sequence (Scale Factor 4)

signal from the counter is amplified and held at a constant dc level by the reference amplifier (Q1, Q2) and the input amplifier (A3). The first pulse triggers all the binaries and the gate flip-flop. The output of the gate flip-flop is amplified by the start amplifier and opens the counter main gate. The second pulse turns off Q4 and turns on Q5. The third pulse turns off Q5 and turns on Q4. The output of Q4 turns off Q6 and turns on Q7. The fourth pulse turns off Q4 and turns on Q5. The fifth pulse turns off Q5 and turns on Q4. The output of Q4 turns off Q7 and turns on Q6. The output of Q6 turns off Q8 and turns on Q9. The sixth pulse turns off Q4 and turns on Q5. The seventh pulse turns off Q5 and turns on Q4. The output of Q4 turns off Q6 and turns on Q7. The eighth pulse turns off Q4 and turns on Q5. The ninth pulse turns off Q5 and turns on Q4. The output of Q4 turns off Q7 and turns on Q6. The output of Q6 turns off Q9 and turns on Q8. The output of Q8 triggers the gate flip-flop Q11, Q12. The output of the gate flip-flop is amplified by the stop amplifier Q14 and closes the main gate of the counter. Therefore nine pulses have been counted to measure eight periods of the gate triggering signal

4-16. 200 Mc RANGE. In the 200 Mc function, binaries A and B are bi-stable multivibrators and binary C is a mono-stable multivibrator (see Paragraph 4-16). The reset pulse from the counter sets the binaries so Q5, Q7, and Q9 are conducting (see Figure 4-3). The first pulse turns off Q5 and turns on Q4. The output of Q4 turns off Q7 and turns on Q6. The output of Q6 turns off Q9 and turns on Q8. The output of Q8 triggers the gate flip-flop; binary C returns to original state, Q8 off and Q9 on. The output of the gate flip-flop is amplified by the start amplifier and opens the main gate of the counter. The second pulse turns off Q4 and turns on Q5. The third pulse turns Q5 off and Q4 on. The output of Q4 turns Q6 off and Q7 on. The fourth pulse turns Q4 off and Q5 on. The fifth pulse turns Q5 off and Q4 on. The output of Q4 turns Q7 off and Q6 on. The output of Q6 turns Q9 off and Q8 on. The output of Q8 triggers the gate flip-flop. Binary C returns to its original state, Q8 off and Q9 on. The output of the gate flip-flop is amplified by the stop amplifier and closes

the main gate of the counter. Five pulses have been counted to measure four periods of the gate triggering signal.

4-17. 100 Mc RANGE. In the 100 Mc function binary A is a bi-stable multivibrator. Binaries B and C are mono-stable multivibrators (see Figure 4-4). The reset pulse from the counter sets the binaries so Q5, Q7, and Q9 are conducting. The first pulse turns Q5 off and Q4 on. The output of Q4 turns Q7 off and Q6 on. The output of Q6 turns Q9 off and Q8 on. The output of Q8 triggers the gate flip-flop. Binaries B and C return to their original state; Q6, Q8 off and Q7, Q9 on. The output of the gate flip-flop is amplified by the start amplifier and opens the main gate of the counter. The second pulse turns Q4 off and Q5 on. The third pulse turns Q5 off and Q4 on. The output of Q4 turns Q7 off and Q6 on. The output of Q6 turns Q9 off and Q8 on. The output of Q8 triggers the gate flip-flop, Binaries B and C return to their original state; Q6, Q8 off and Q7, Q9 on. The output of the gate flip-flop is amplified by the stop amplifier and closes the main gate of the counter. Three pulses have been counted to measure two periods of gate triggering signal.

4-18. When a binary operates as a monostable multivibrator the following events occur (binary B reference designators used in example). The DC coupling path (R23) for the collector of Q6 is disconnected. Q7 is conducting. The negative triggering pulse reduces conduction of Q7; the resulting positive-going voltage at Q7 collector is applied to the Q6 base through the R19-R20 divider (C9 bypasses R19 to provide coupling for the rapidly changing voltage at the Q7 collector); Q6 begins to conduct; the resulting negative-going change in Q6 collector voltage is coupled through C10 to the Q7 base to further decrease Q7 conduction. The process is regenerative and quickly results in Q7 being cut off and Q6 being saturated. Capacitor C10 now charges at a rate mainly determined by the values of R22, R24, and C10. When the Q7 base voltage becomes sufficiently positive, Q7 begins conduction and Q6 and Q7 return to their original state.

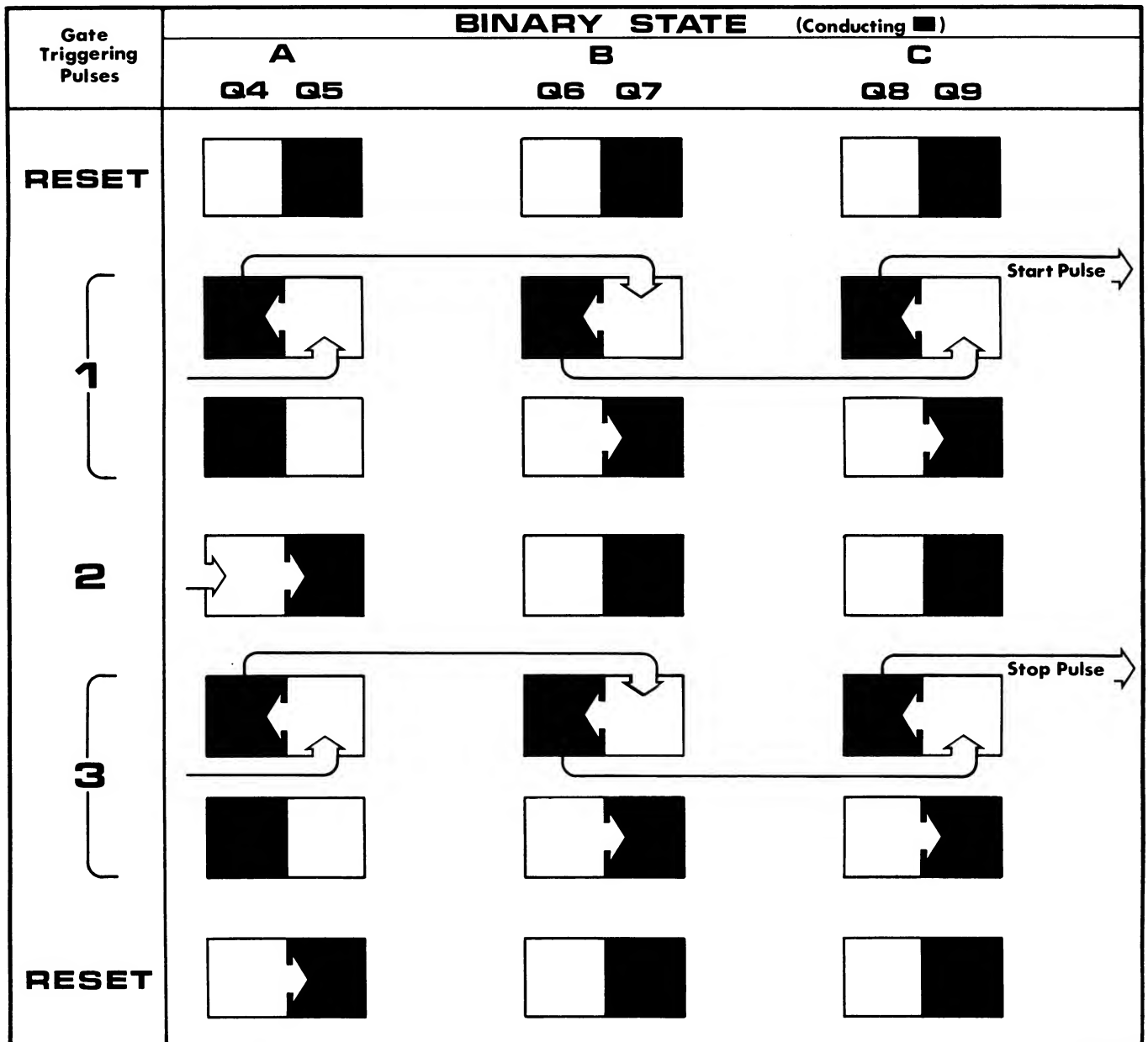


Figure 4-4. Divider Sequence (Scale Factor 2)

Table 5-1. Recommended Test Equipment

Instrument Type	Required Characteristics	Use	Instrument Recommended
Oscilloscope	350 Mc bandwidth, dual trace plug-in, ext sync capability.	Observe waveforms during troubleshooting, adjustments, and performance check.	Ⓜ Model 185A Ⓜ Model 188A Dual Trace Vertical Amplifier
AC Voltmeter	1 cps to 1 Mc 100 mv F. S.	Performance Check	Ⓜ Model 403A
AC Voltmeter	500 Kc to 500 Mc 100 mv F. S.	Performance Check	Ⓜ Model 411A
Low Frequency Oscillator	Continuously variable from 1 cps to 10 cps, 100 mv output	Performance Check	Ⓜ Model 202C
Test Oscillator	Continuously variable from 10 cps to 10 Mc, 100 mv output	Performance Check	Ⓜ Model 651A
VHF Signal Generator	Continuously variable from 10 Mc to 350 Mc, 100 mv output	Performance Check	Ⓜ Model 608C
Pulse Generator	10 nsec wide, 1 v pulse, 1 Mc repetition rate	Pulse adjustment	Ⓜ Model 215A
Electronic Counter	Operate with the Model 5252A Prescaler plug-in	Required for 5252A operation	Ⓜ Model 5245L
Resistive Divider	10:1	Performance Check	Ⓜ Model 10201B
"N" Type Tee Connector	50 ohm	Performance Check	Ⓜ Model 10204B
Termination	50 ohm	Performance Check	Ⓜ Model 10501A
BNC Tee Connector		Performance Check	
Extender Cable		Troubleshooting and Adjustments	Ⓜ Model 10506B
Tee Connector	"N" Type	Performance Check	Ⓜ Model 11024A
Termination	50 ohm "N" Type	Performance Check	Ⓜ Model 908A
Attenuator	0-12 db 1 db steps 50 ohms	Performance Check	Ⓜ Model 355C
T-Pad	6 db 50 ohm	Performance Check	
Delay Line	50 ohm constant impedance trombone line	Performance Check	General Radio Model 874-LT
Hot Carrier Diodes		Performance Check	hpa Model 2301

SECTION V

MAINTENANCE

5-1. INTRODUCTION.

5-2. This section provides maintenance and service information for the Model 5252A Prescaler. Included are a table of recommended test equipment, repair and adjustment procedures and an in-cabinet performance check which may be used to verify proper operation of the plug-in.

5-3. TEST EQUIPMENT.

5-4. Recommended test equipment for maintenance and performance checking is listed in Table 5-1. Test instruments other than those listed may be used if their specifications equal or exceed the required characteristics.

5-5. IN-CABINET PERFORMANCE CHECK.

5-6. The in-cabinet performance checks, Table 5-3, verify specifications and provide a permanent record of the performance of each instrument.

5-7. ASSEMBLY CONNECTION IDENTIFICATION.

5-8. Throughout the manual, connections to printed circuit assemblies are referred to in abbreviated form. For example, the connection to pin 12 of assembly A2 is A2(12).

5-9. TROUBLESHOOTING AND REPAIR.

5-10. SUBSTITUTION. Troubleshooting may be greatly simplified if checking is done by replacing assembly suspected of malfunction with spare assembly known to be operating correctly. When the malfunctioning assembly is found, trouble then may be traced to individual components responsible for malfunction, or the malfunctioning assembly may be shipped to your Hewlett-Packard field office for repair.

5-11. TROUBLESHOOTING OF ASSEMBLIES. Refer to Section IV, Principles of Operation, for information on the operation of circuits. Consult the component location figures, signal waveforms, and voltages which are included with the assembly schematics at the rear of this section. For easy access to assembly circuits during operation, use the printed circuit assembly extension board provided with each counter.

5-12. PRINTED CIRCUIT COMPONENT REPLACEMENT. Component lead holes in the Model 5252A circuit boards have plated walls to ensure good electrical contact between conductors on the opposite sides of the board. To prevent damage to this plating and to the replacement component, apply heat sparingly and work carefully. The following replacement procedure is recommended.

- a. Remove defective component.
- b. Melt solder in component lead holes. Use clean dry soldering iron to remove excess solder. Clean holes with toothpick or wooden splinter. Do not use

metal tool for cleaning as this may damage through-hole plating.

- c. Bend lead of replacement component to the correct shape and insert component leads into component lead holes. Using heat and solder sparingly, solder leads in place. Heat may be applied to either side of board. A heat sink (longnose pliers, commercial heat-sink tweezers, etc) should be used when replacing transistors and diodes in order to prevent conduction of excessive heat from the soldering iron to the component.

- d. Through-hole plating breaks are indicated by the separation from the board of the round conductor pad on either side of the board. To repair breaks, press conductor pads against board and solder replacement component lead to conductor pad on both sides of the board.

5-13. WAVEFORMS AND RESISTANCE CHECKS. Test points and waveforms for the prescaler assembly are shown in Figures 5-2 and 5-3. Resistance checks are provided in Table 5-2.

Note

When replacing inductors that are lengths of hookup wire be sure the lengths are the same. This is important for proper operation of the prescaler.

Table 5-2. Resistance Check

Location	Resistance
P6(13)	700 to 900 ohms
P6(15)	650 to 950 ohms
P6(20)	3700 to 4700 ohms
P6(46)	160 to 240 ohms

5-14. LEVEL CONTROL ADJUSTMENTS.

5-15. SINE WAVE OPERATION.

5-16. To obtain maximum sensitivity for sine wave operation, perform the following steps:

- a. Apply a 225Mc 100mVrms signal to the prescaler with MAX COUNT RATE switch in the 350 Mc position.
- b. Adjust LEVEL control until a stable count of the input frequency is obtained.
- c. Reduce input signal amplitude and reset LEVEL control for stable count.
- d. Repeat procedure until a stable count occurs at minimum signal amplitude.

5-17. PULSE OPERATION.

5-18. To insure proper operation of the plug-in with a pulse input signal, perform the following adjustment:

a. Apply a 1v 20 nsec pulse of the desired polarity to the input of the prescaler.

b. For a positive pulse, adjust the LEVEL control in a clockwise direction until correct count is obtained.

c. For a negative pulse, adjust the LEVEL control in a counterclockwise direction until correct count is obtained.

Table 5-3. In-Cabinet Performance Check

1. RANGE: DC to 350 Mc

a. Connect test system as shown in the following figure



b. Install 5252A in counter.

c. Set controls as follows:

SAMPLE RATE	slightly clockwise out of POWER OFF
SENSITIVITY	PLUG IN
TIME BASE	10 ms
FUNCTION	FREQUENCY
MAX COUNT RATE (plug-in)	350 Mc

d. Connect output of VHF Signal Generator to the plug-in and monitor the input signal with the ac voltmeter as shown above. Set Generator output for 0.1v rms (0.28v peak-to-peak).

e. Vary frequency of VHF Signal Generator from 350 Mc to 10 Mc, keeping output constant at 0.1v rms (0.28v p-p). Counter should properly display frequencies in this range.

f. Change MAX COUNT RATE switch to 200 Mc and vary VHF Signal Generators from 200 Mc to 10 Mc, keeping output constant at 0.1v rms (0.28v p-p). Counter should properly display frequencies in this range.

g. Change MAX COUNT RATE switch to 100 Mc and vary VHF Signal Generators from 100 Mc to 10 Mc, keeping output constant at 0.1v rms (0.28v p-p). Counter should properly display frequencies in this range.

h. Substitute Test Oscillator for VHF Signal Generator.

i. Set MAX COUNT RATE to 350 Mc and vary Test Oscillator frequency from 10 Mc to 10 cps, keeping output constant at 0.1v rms (0.28v p-p). Counter should properly display frequencies in this range.

j. Repeat step h with the MAX COUNT RATE switch in 200 Mc and 100 Mc positions.

k. Substitute Low Frequency Oscillator for Test Oscillator.

m. Set MAX COUNT RATE to 350 Mc and vary Low Frequency Oscillator from 10 cps to 1 cps, keeping output constant at 0.1v rms (0.28v p-p). Counter should properly display frequencies in this range.

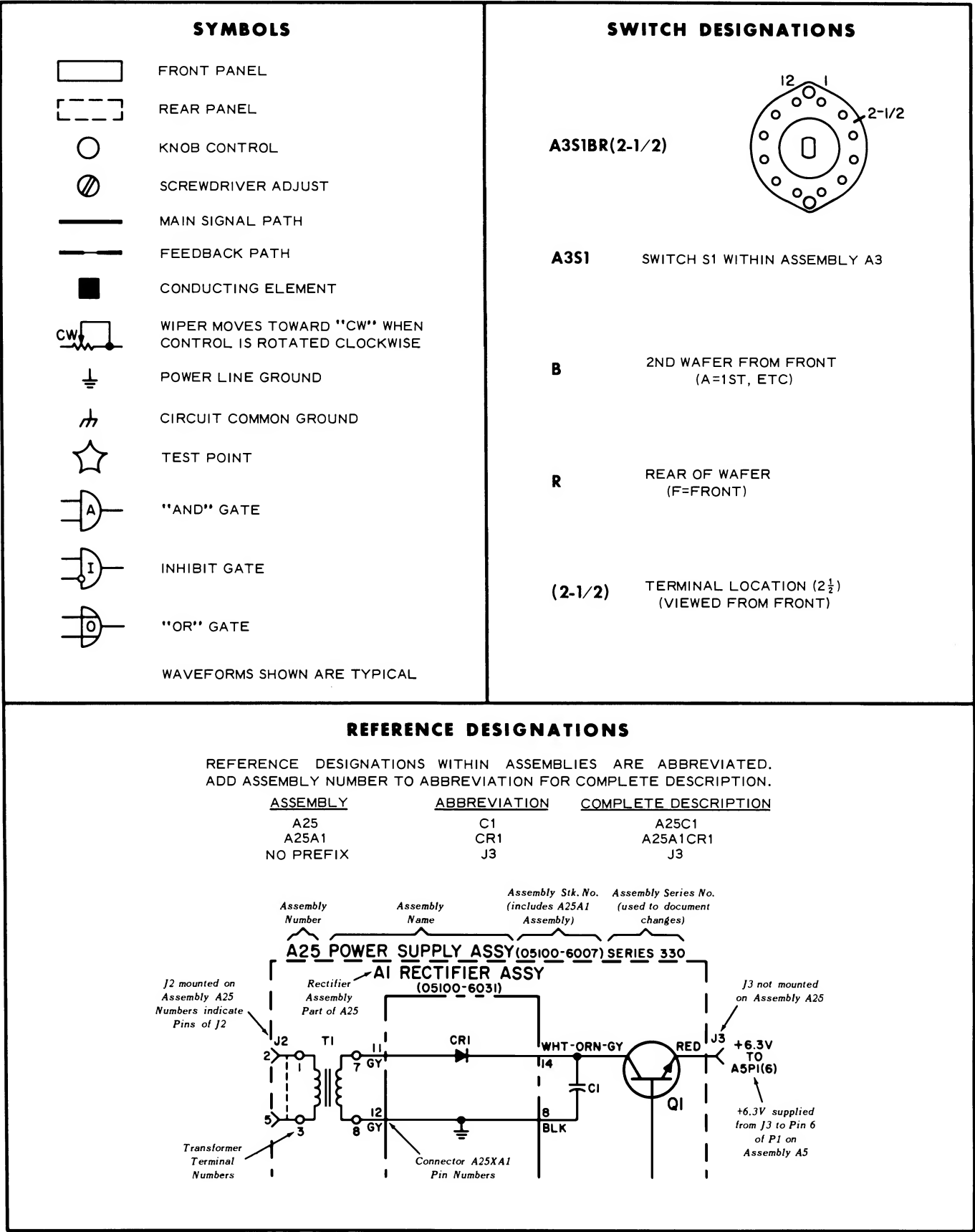
n. Repeat step k with the MAX COUNT RATE switch in 200 Mc and 100 Mc positions.

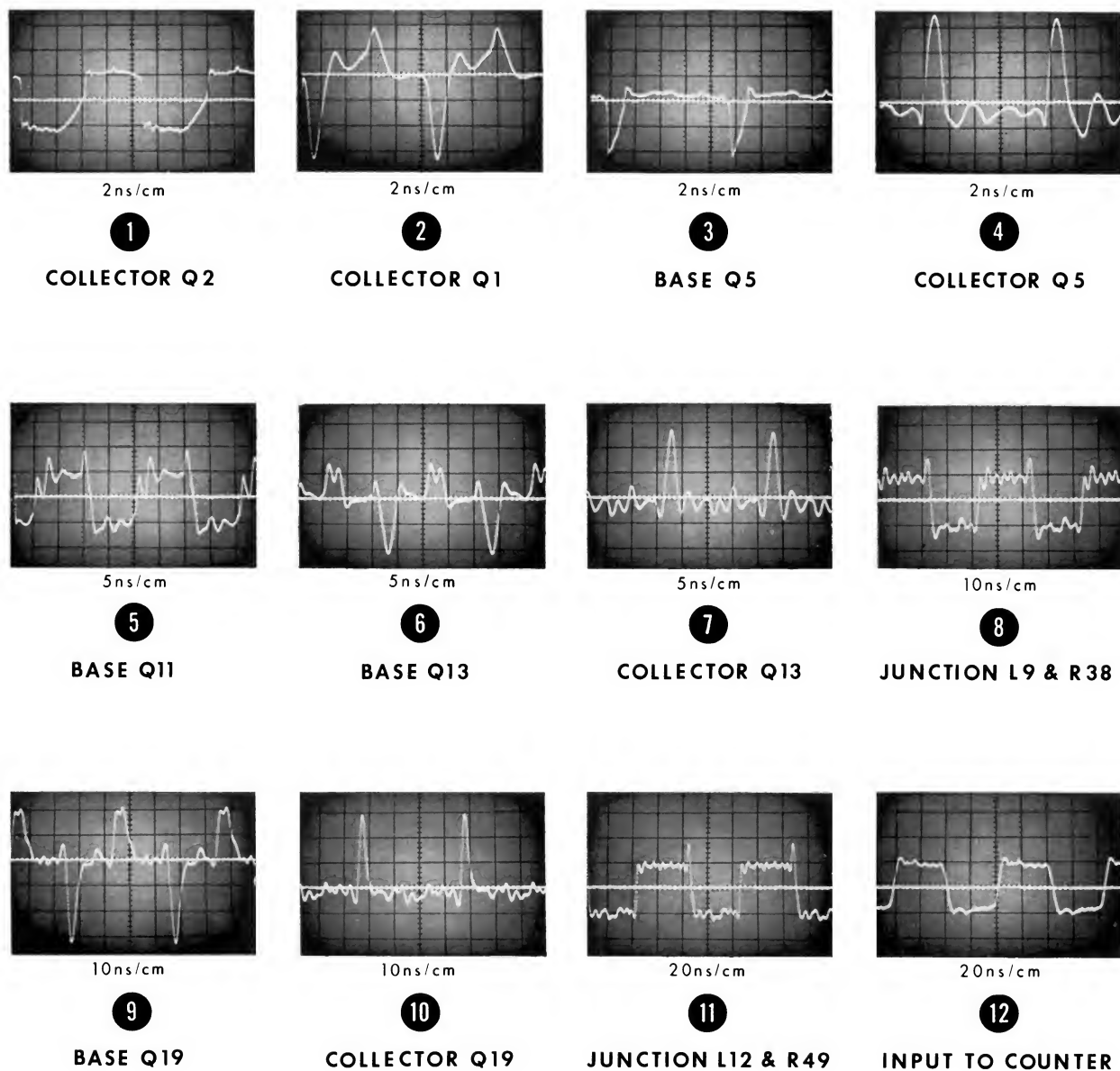
2. SENSITIVITY: 0.1v rms sine wave

Checked in step 1 under RANGE check.

Table 5-3. In-Cabinet Performance Check (Cont'd)

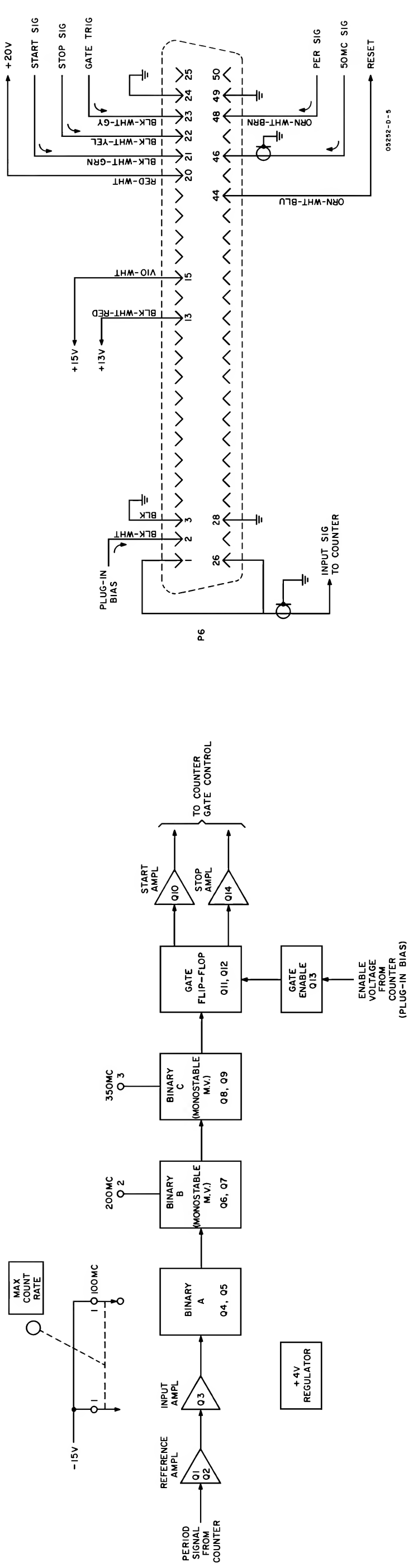
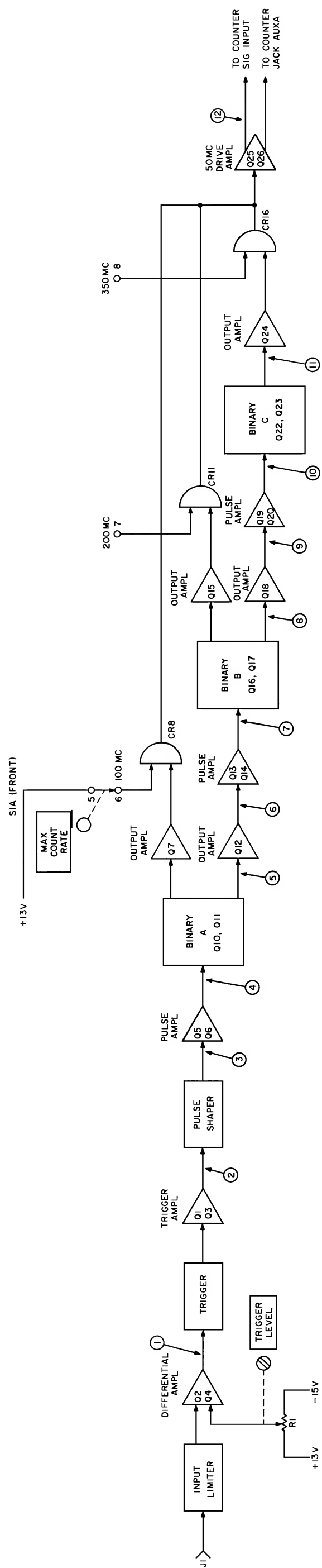
<p>3. SCALED OUTPUT: > 0.1v rms into 50 ohms (counter AUX A jack).</p> <p>a. Connect VHF Signal Generator to Prescaler. Set output frequency at 240 Mc; MAX COUNT RATE switch at 350 Mc.</p> <p>b. Set Generator output level to 0.1v rms (0.28v p-p).</p> <p>c. Connect Oscilloscope to AUX A jack (rear of counter). Use 50 ohm Tee connector and 50 ohm load.</p> <p>d. Output should be the input signal scaled by a factor of 8.</p>									
<p>4. ACCURACY: Same as basic Counter.</p> <p>a. Set Counter controls as follows:</p> <table><tr><td>SAMPLE RATE</td><td>slightly clockwise out of POWER OFF</td></tr><tr><td>SENSITIVITY</td><td>CHECK</td></tr><tr><td>TIME BASE</td><td>1 s</td></tr><tr><td>FUNCTION</td><td>FREQUENCY</td></tr></table> <p>b. Note reading on Counter.</p> <p>c. Connect 10 Mc output from rear of counter to INPUT of Prescaler. Set Counter SENSITIVITY switch to PLUG-IN.</p> <p>d. Counter display should be the same. Check all positions of the MAX COUNT RATE switch.</p>		SAMPLE RATE	slightly clockwise out of POWER OFF	SENSITIVITY	CHECK	TIME BASE	1 s	FUNCTION	FREQUENCY
SAMPLE RATE	slightly clockwise out of POWER OFF								
SENSITIVITY	CHECK								
TIME BASE	1 s								
FUNCTION	FREQUENCY								
<p>5. DOUBLE PULSE RESOLUTION: 2.8 ns PULSE AMPLITUDE: 280 mv</p> <p>a. Set up test system as shown in the following picture.</p> <div data-bbox="199 1355 1425 1713"></div>									
<p>b. Set pulse rate at 1 Mc, 250 mv.</p> <p>c. Check resolution on Oscilloscope.</p>									



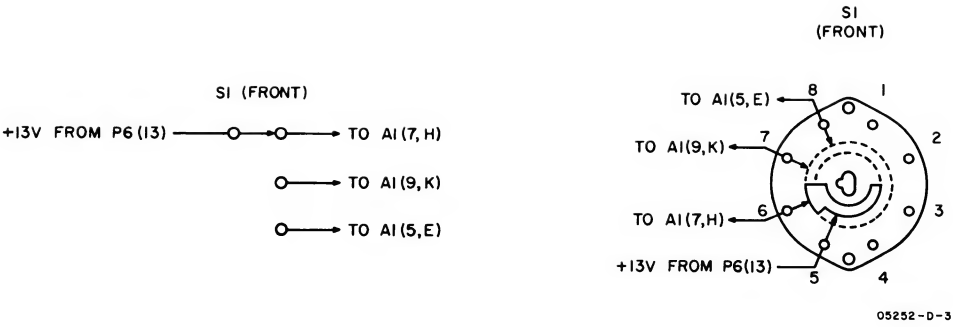
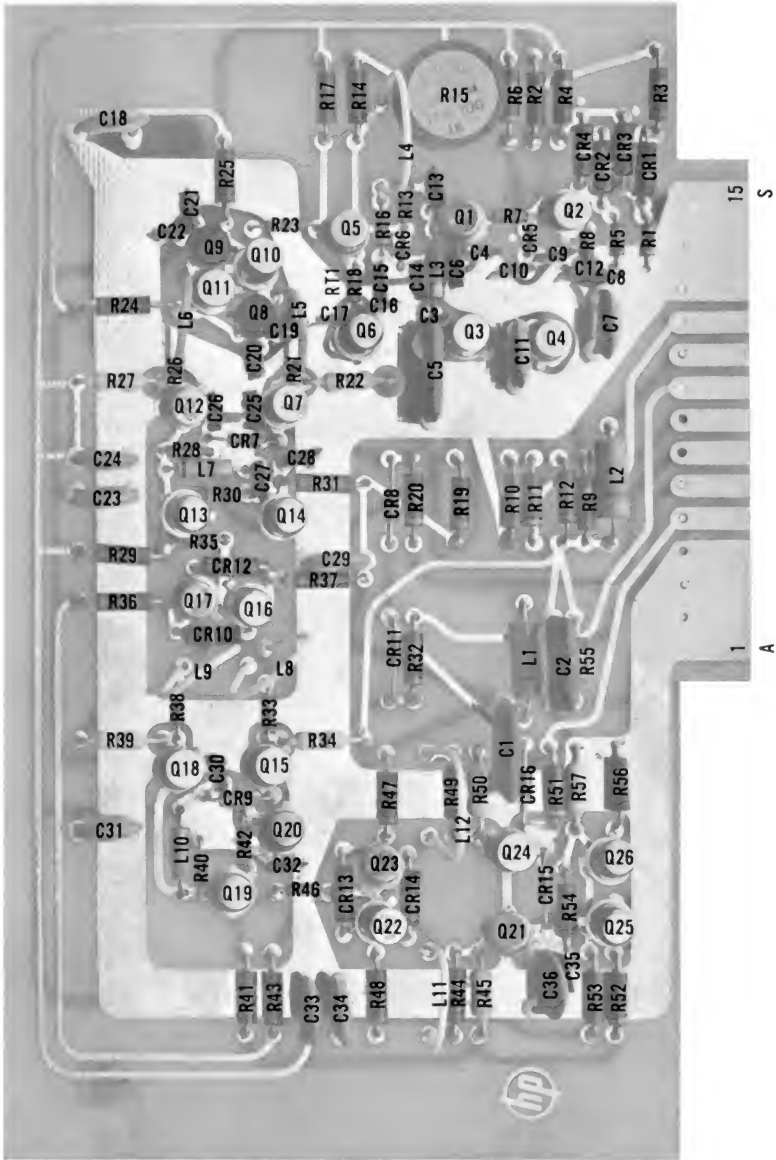


ALL WAVEFORMS 200mv/cm VERT.
 SYNC OSCILLOSCOPE TO INCOMING SIGNAL

Figure 5-2. Prescaler Waveforms



5-5/5-6



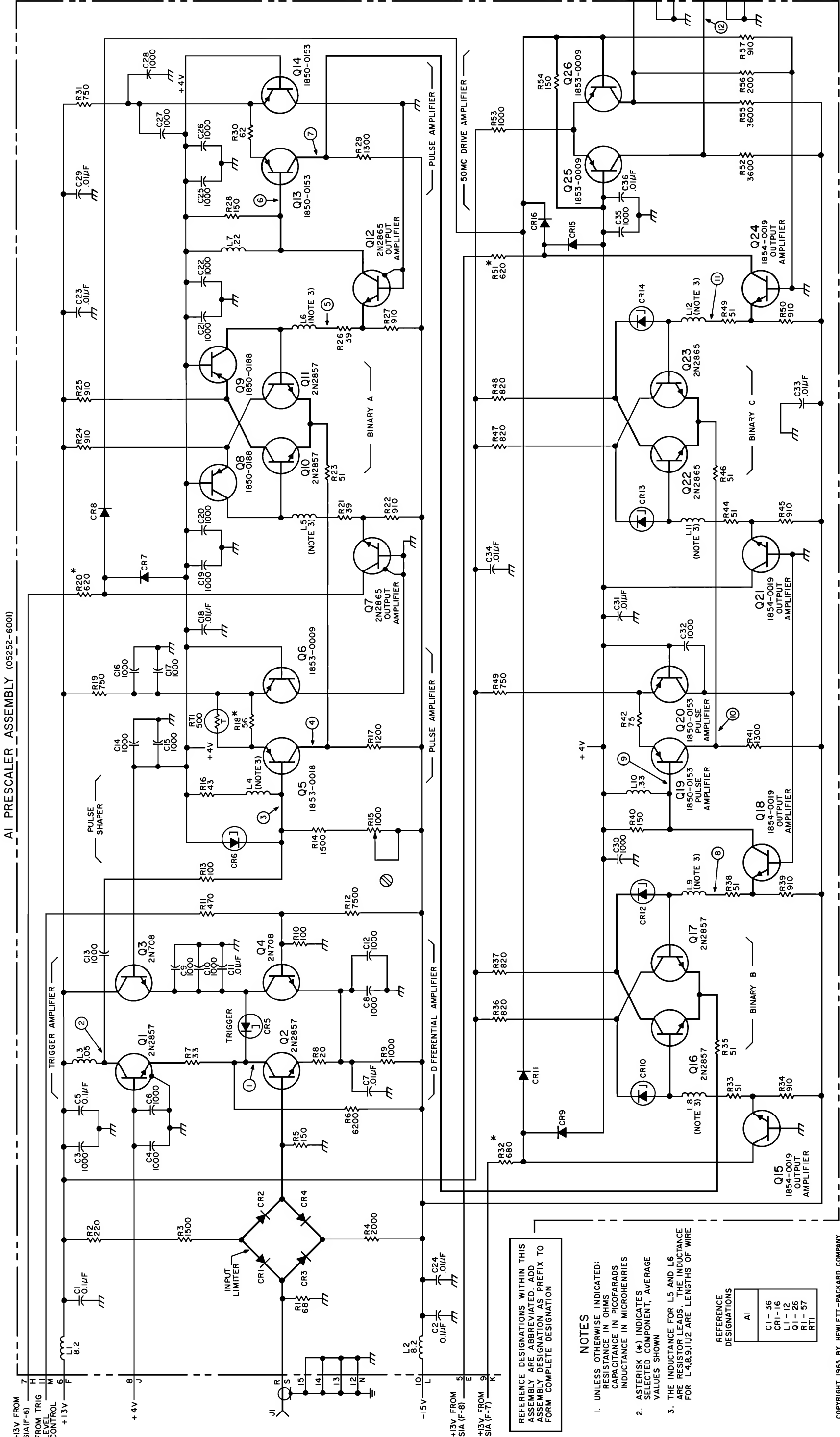
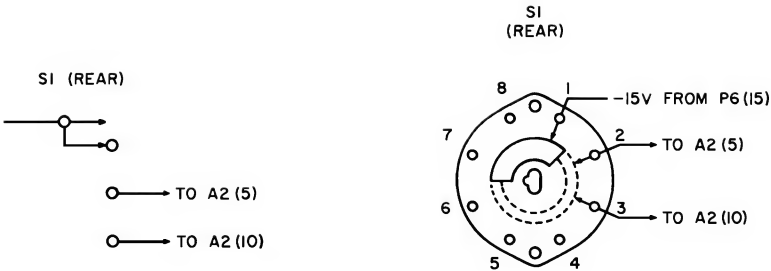
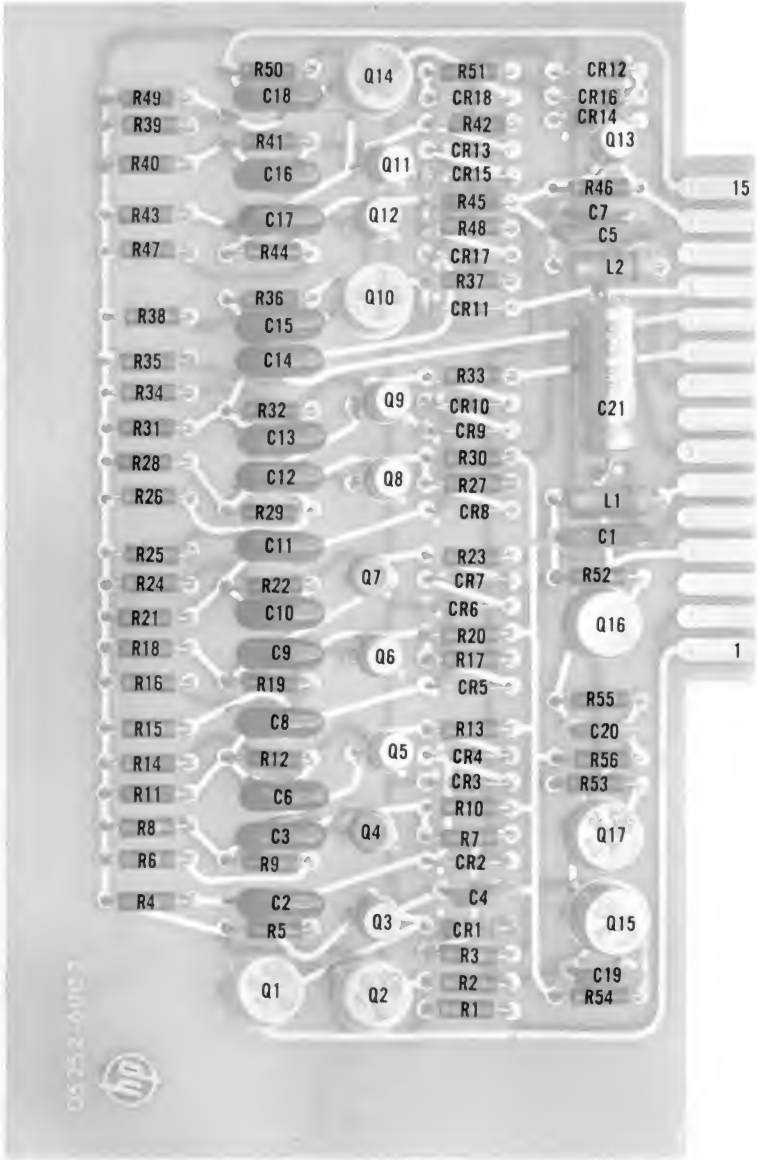


Figure 5-4. Prescaler Assembly A1 and S1(F)



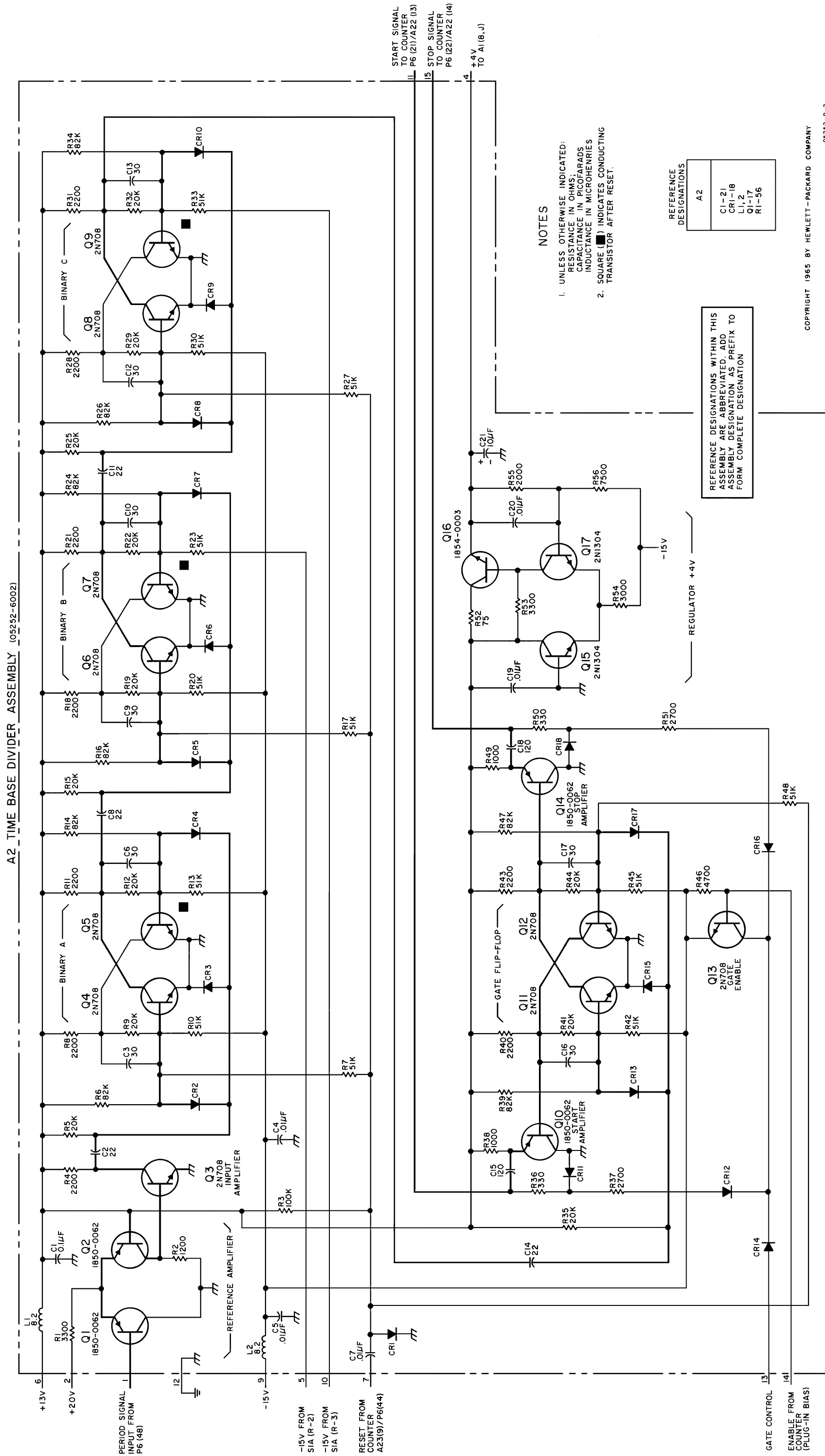


Figure 5-5. Time Base Divider Assembly A2 and S1(R)

SECTION VI

REPLACEABLE PARTS

6-1. INTRODUCTION.

6-2. This section contains information for ordering replacement parts. Table 6-1 lists parts in alpha-numerical order of their reference designators and indicates the description and ϕ stock number of each part, together with any applicable notes. Table 6-2 lists parts in alpha-numerical order of their ϕ stock number and provides the following information on each part;

- a. Description of the part (see list of abbreviations below).
- b. Typical manufacturer of the part in a five-digit code; see list of manufacturers in Table 6-3.
- c. Manufacturer's part number.
- d. Total quantity used in the instrument (TQ column).

6-3. Miscellaneous parts are listed at the end of Table 6-1.

6-4. ORDERING INFORMATION.

6-5. To obtain replacement parts, address order or inquiry to your local Hewlett-Packard Field Office (see lists at rear of this manual for addresses). Identify parts by their Hewlett-Packard stock numbers.

6-6. To obtain a part that is not listed, include:

- a. Instrument model number.
- b. Instrument serial number.
- c. Description of the part.
- d. Function and location of the part.

REFERENCE DESIGNATORS

A = assembly	E = misc electronic part	MP = mechanical part	TB = terminal board
B = motor	F = fuse	P = plug	TP = test point
BT = battery	FL = filter	Q = transistor	V = vacuum, tube, neon bulb, photocell, etc.
C = capacitor	J = jack	R = resistor	W = cable
CP = coupler	K = relay	RT = thermistor	X = socket
CR = diode	L = inductor	S = switch	Y = crystal
DL = delay line	M = meter	T = transformer	
DS = device signaling (lamp)			

ABBREVIATIONS

A = amperes	GE = germanium	N/C = normally closed	RMO = rack mount only
A. F. C. = automatic frequency control	GL = glass	NE = neon	RMS = root-mean square
AMPL = amplifier	GRD = ground(ed)	NI PL = nickel plate	RWV = reverse working voltage
		N/O = normally open	S-B = slow-blow
B. F. O. = beat frequency oscillator	H = henries	NPO = negative positive zero (zero temperature coefficient)	SCR = screw
BE CU = beryllium copper	HEX = hexagonal	NRFR = not recommended for field replacement	SE = selenium
BH = binder head	HG = mercury	NSR = not separately replaceable	SECT = section(s)
BP = bandpass	HR = hour(s)		SEMICON = semiconductor
BRS = brass			SI = silicon
BWO = backward wave oscillator	IF = intermediate freq		SIL = silver
	IMPG = impregnated		SL = slide
	INCD = incandescent	OBD = order by description	SPL = special
CCW = counter-clockwise	INCL = include(s)	OH = oval head	SST = stainless steel
CER = ceramic	INS = insulation(ed)	OX = oxide	SR = split ring
CMO = cabinet mount only	INT = internal		STL = steel
COEF = coefficient			
COM = common	K = kilo = 1000	P = peak	TA = tantalum
COMP = composition		PC = printed circuit	TD = time delay
CONN = connector	LIN = linear taper	PF = picofarads = 10 ⁻¹² farads	TGL = toggle
CP = cadmium plate	LK WASH = lock washer	PH BRZ = phosphor bronze	TI = titanium
CRT = cathode-ray tube	LOG = logarithmic taper	PHL = Phillips	TOL = tolerance
CW = clockwise	LPF = low pass filter	PIV = peak inverse voltage	TRIM = trimmer
		P/O = part of	TWT = traveling wave tube
DEPC = deposited carbon	M = milli = 10 ⁻³	POLY = polystyrene	U = micro = 10 ⁻⁶
DR = drive	MEG = meg = 10 ⁶	PORC = porcelain	VAR = variable
	MET FLM = metal film	POS = position(s)	VDCW = dc working volts
ELECT = electrolytic	MET OX = metallic oxide	POT = potentiometer	
ENCAP = encapsulated	MFR = manufacturer	PP = peak-to-peak	W/ = with
EXT = external	MINAT = miniature	PT = point	W = watts
	MOM = momentary	PWV = peak working voltage	WIV = working inverse voltage
F = farads	MTG = mounting	RECT = rectifier	WW = wirewound
FH = flat head	MY = "mylar"	RF = radio frequency	W/O = without
FIL H = fillister head		RH = round head	
FXD = fixed	N = nano (10 ⁻⁹)	RIV = reverse inverse voltage	

01194-11

02171-1

Table 6-1 Reference Designation Index

Reference Designation	Stock No.	Description #	Note
A1	05252-6001	PRESCALER ASSY	
A1C1	0150-0121	C:FXD CER 0.1UF +80%-20% 50VDCW	
A1C2	0150-0121	C:FXD CER 0.1UF +80%-20% 50VDCW	
A1C3	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A1C4	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A1C5	0150-0121	C:FXD CER 0.1UF +80%-20% 50VDCW	
A1C6	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A1C7	0150-0093	C:FXD CER 0.01UF +80-20% 100VDCW	
A1C8	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A1C9	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A1C10	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A1C11	0150-0093	C:FXD CER 0.01UF +80-20% 100VDCW	
A1C12	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A1C13	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A1C14	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A1C15	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A1C16	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A1C17	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A1C18	0150-0093	C:FXD CER 0.01UF +80-20% 100VDCW	
A1C19	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A1C20	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A1C21	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A1C22	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A1C23	0150-0093	C:FXD CER 0.01UF +80-20% 100VDCW	
A1C24	0150-0093	C:FXD CER 0.01UF +80-20% 100VDCW	
A1C25	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A1C26	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A1C27	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A1C28	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A1C29	0150-0093	C:FXD CER 0.01UF +80-20% 100VDCW	
A1C30	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A1C31	0150-0093	C:FXD CER 0.01UF +80-20% 100VDCW	
A1C32	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A1C33	0150-0093	C:FXD CER 0.01UF +80-20% 100VDCW	
A1C34	0150-0093	C:FXD CER 0.01UF +80-20% 100VDCW	
A1C35	0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	
A1C36	0150-0093	C:FXD CER 0.01UF +80-20% 100VDCW	
A1CR1	1901-0179	DIODE:SILICON	
A1CR2	1901-0179	DIODE:SILICON	
A1CR3	1901-0179	DIODE:SILICON	
A1CR4	1901-0179	DIODE:SILICON	
A1CR5	1912-0012	DIODE:TUNNEL GERMANIUM 10MA	
A1CR6	1912-0012	DIODE:TUNNEL GERMANIUM 10MA	
A1CR7	1901-0040	DIODE:SILICON	
A1CR8	1901-0040	DIODE:SILICON	
A1CR9	1901-0040	DIODE:SILICON	
A1CR10	1902-3079	DIODE:BREAKDOWN SILICON 4.35V 50%	
A1CR11	1901-0040	DIODE:SILICON	
A1CR12	1902-3079	DIODE:BREAKDOWN SILICON 4.35V 50%	

See list of abbreviations in introduction to this section

Table 6-1 Reference Designation Index (Cont'd)

Reference Designation	Ⓢ Stock No.	Description #	Note
A1CR13	1902-3079	DIODE: BREAKDOWN SILICON 4.35V 50%	
A1CR14	1902-3079	DIODE: BREAKDOWN SILICON 4.35V 50%	
A1CR15	1901-0040	DIODE: SILICON	
A1CR16	1901-0040	DIODE: SILICON	
A1L1	9140-0105	COIL: RF FXD 8.2UH	
A1L2	9140-0105	COIL: RF FXD 8.2UH	
A1L3	9100-0346	COIL: RF FXD 0.05UH 20%	
A1L4		WIRE: ELECTRICAL 28AWG TEFLON INS	
A1L5		WIRE: ELECTRICAL 28AWG TEFLON INS	
A1L6		WIRE: ELECTRICAL 28AWG TEFLON INS	
A1L7	9170-0497	COIL: FXD RF 0.22UH 10%	
A1L8		WIRE: ELECTRICAL 28AWG TEFLON INS	
A1L9		WIRE: ELECTRICAL 28AWG TEFLON INS	
A1L10	9100-0368	COIL: RF FXD 0.33UH 10%	
A1L11		WIRE: ELECTRICAL 28AWG TEFLON INS	
A1L12		WIRE: ELECTRICAL 28AWG TEFLON INS	
A1Q1	1854-0048	TRANSISTOR: SILICON NPN 2N2857	
A1Q2	1854-0048	TRANSISTOR: SILICON NPN 2N2857	
A1Q3	1854-0005	TRANSISTOR: SILICON NPN 2N708	
A1Q4	1854-0005	TRANSISTOR: SILICON NPN 2N708	
A1Q5	1853-0018	TRANSISTOR: SILICON PNP	
A1Q6	1853-0009	TRANSISTOR: SILICON PNP	
A1Q7	1854-0031	TRANSISTOR: SILICON NPN 2N2865	
A1Q8	1850-0066	TRANSISTOR	
A1Q9	1850-0066	TRANSISTOR	
A1Q10	1854-0048	TRANSISTOR: SILICON NPN 2N2857	
A1Q11	1854-0048	TRANSISTOR: SILICON NPN 2N2857	
A1Q12	1854-0031	TRANSISTOR: SILICON NPN 2N2865	
A1Q13	1850-0153	TRANSISTOR: PNP	
A1Q14	1850-0153	TRANSISTOR: PNP	
A1Q15	1854-0019	TRANSISTOR: SILICON NPN	
A1Q16	1854-0048	TRANSISTOR: SILICON NPN 2N2857	
A1Q17	1854-0048	TRANSISTOR: SILICON NPN 2N2857	
A1Q18	1854-0019	TRANSISTOR: SILICON NPN	
A1Q19	1850-0153	TRANSISTOR: PNP	
A1Q20	1850-0153	TRANSISTOR: PNP	
A1Q21	1854-0019	TRANSISTOR: SILICON NPN	
A1Q22	1854-0031	TRANSISTOR: SILICON NPN 2N2865	
A1Q23	1854-0031	TRANSISTOR: SILICON NPN 2N2865	
A1Q24	1854-0019	TRANSISTOR: SILICON NPN	
A1Q25	1853-0009	TRANSISTOR: SILICON PNP	
A1Q26	1853-0009	TRANSISTOR: SILICON PNP	
A1R1	0698-3379	R: FXD COMP 68 OHM 5% 1/8W	
A1R2	0683-2215	R: FXD COMP 220 OHM 5% 1/4W	
A1R3	0683-1525	R: FXD COMP 1500 OHM 5% 1/4W	
A1R4	0683-2025	R: FXD COMP 2000 OHM 5% 1/4W	
A1R5	0698-3381	R: FXD COMP 150 OHM 5% 1/8W	
A1R6	0683-6225	R: FXD COMP 6200 OHM 5% 1/4W	
A1R7	0698-3375	R: FXD COMP 33 OHM 5% 1/8W	

See list of abbreviations in introduction to this section

Table 6-1. Reference Designation Index (Cont'd)

Reference Designation	Ⓢ Stock No.	Description #	Note
A1R8	0698-3374	RIFXD COMP 20 OHM 5% 1/8W	
A1R9	0683-1025	RIFXD COMP 1000 OHM 5% 1/4W	
A1R10	0683-1015	RIFXD COMP 100 OHM 5% 1/4W	
A1R11	0683-4715	RIFXD COMP 470 OHM 5% 1/4W	
A1R12	0683-7525	RIFXD COMP 7500 OHM 5% 1/4W	
A1R13	0698-3113	RIFXD COMP 100 OHM 5% 1/8W	
A1R14	0683-1525	RIFXD COMP 1500 OHM 5% 1/4W	
A1R15	2100-0755	RIVAR WW 1000 OHM 5%	
A1R16	0698-3376	RIFXD COMP 43 OHM 5% 1/8W	
A1R17	0683-1225	RIFXD COMP 1200 OHM 5% 1/4W	
A1R18	0698-4131	RIFXD MET FLM 560 OHM	
A1R19	0683-7515	RIFXD COMP 750 OHM 5% 1/4W	
A1R20	0683-6215	RIFXD COMP 620 OHM 5% 1/4W FACTORY SELECTED COMP, TYPICAL VALUE GIVEN	
A1R21	0698-4130	RIFXD MET FLM 39 OHM	
A1R22	0757-0923	RIFXD MET FLM 910 OHM 2% 1/8W	
A1R23	0698-3378	RIFXD COMP 51 OHM 5% 1/8W	
A1R24	0757-0923	RIFXD MET FLM 910 OHM 2% 1/8W	
A1R25	0757-0923	RIFXD MET FLM 910 OHM 2% 1/8W	
A1R26	0698-4130	RIFXD MET FLM 39 OHM	
A1R27	0757-0923	RIFXD MET FLM 910 OHM 2% 1/8W	
A1R28	0698-3381	RIFXD COMP 150 OHM 5% 1/8W	
A1R29	0683-1325	RIFXD COMP 1300 OHM 5% 1/4W	
A1R30	0698-4132	RIFXD MET FLM 62 OHM	
A1R31	0683-7515	RIFXD COMP 750 OHM 5% 1/4W	
A1R32	0683-6815	RIFXD COMP 680 OHM 5% 1/4W	
A1R33	0698-3378	RIFXD COMP 51 OHM 5% 1/8W	
A1R34	0757-0923	RIFXD MET FLM 910 OHM 2% 1/8W	
A1R35	0698-3378	RIFXD COMP 51 OHM 5% 1/8W	
A1R36	0683-8215	RIFXD COMP 820 OHM 5% 1/4W	
A1R37	0683-8215	RIFXD COMP 820 OHM 5% 1/4W	
A1R38	0698-3378	RIFXD COMP 51 OHM 5% 1/8W	
A1R39	0757-0923	RIFXD MET FLM 910 OHM 2% 1/8W	
A1R40	0698-3381	RIFXD COMP 150 OHM 5% 1/8W	
A1R41	0683-1325	RIFXD COMP 1300 OHM 5% 1/4W	
A1R42	0698-3380	RIFXD COMP 75 OHM 5% 1/8W	
A1R43	0683-7515	RIFXD COMP 750 OHM 5% 1/4W	
A1R44	0683-5105	RIFXD COMP 51 OHM 5% 1/4W	
A1R45	0757-0923	RIFXD MET FLM 910 OHM 2% 1/8W	
A1R46	0698-3378	RIFXD COMP 51 OHM 5% 1/8W	
A1R47	0683-8215	RIFXD COMP 820 OHM 5% 1/4W	
A1R48	0683-8215	RIFXD COMP 820 OHM 5% 1/4W	
A1R49	0683-5105	RIFXD COMP 51 OHM 5% 1/4W	
A1R50	0757-0923	RIFXD MET FLM 910 OHM 2% 1/8W	
A1R51	0683-6215	RIFXD COMP 620 OHM 5% 1/4W FACTORY SELECTED COMP, TYPICAL VALUE GIVEN	
A1R52	0683-3625	RIFXD COMP 3600 OHM 5% 1/4W	
A1R53	0683-1025	RIFXD COMP 1000 OHM 5% 1/4W	
A1R54	0683-1515	RIFXD COMP 150 OHM 5% 1/4W	
A1R55	0683-3625	RIFXD COMP 3600 OHM 5% 1/4W	
A1R56	0683-2015	RIFXD COMP 200 OHM 5% 1/4W	

See list of abbreviations in introduction to this section

Table 6-1. Reference Designation Index (Cont'd)

Reference Designation	Stock No.	Description #	Note
A1R57	0757-0923	R:FXD MET FLM 910 OHM 2% 1/8W	
A1RT1	0839-0021	THERMISTOR:DISC 500 OHM 10%	
A2	05252-6002 05252-2002	TIME BASE ASSY BOARD- ETCHED CIRCUIT	
A2C1	0150-0121	C:FXD CER 0.1UF +80%-20% 50VDCW	
A2C2	0140-0145	C:FXD MICA 22 PF 5% 500 VDCW	
A2C3	0160-0181	C:FXD MICA 30PF 5% 300VDCW	
A2C4	0150-0093	C:FXD CER 0.01UF +80-20% 100VDCW	
A2C5	0150-0121	C:FXD CER 0.1UF +80%-20% 50VDCW	
A2C6	0160-0181	C:FXD MICA 30PF 5% 300VDCW	
A2C7	0150-0093	C:FXD CER 0.01UF +80-20% 100VDCW	
A2C8	0140-0145	C:FXD MICA 22 PF 5% 500 VDCW	
A2C9	0160-0181	C:FXD MICA 30PF 5% 300VDCW	
A2C10	0160-0181	C:FXD MICA 30PF 5% 300VDCW	
A2C11	0140-0145	C:FXD MICA 22 PF 5% 500 VDCW	
A2C12	0160-0181	C:FXD MICA 30PF 5% 300VDCW	
A2C13	0160-0181	C:FXD MICA 30PF 5% 300VDCW	
A2C14	0140-0145	C:FXD MICA 22 PF 5% 500 VDCW	
A2C15	0140-0216	C:FXD MICA 120PF 2% 300VDCW	
A2C16	0160-0181	C:FXD MICA 30PF 5% 300VDCW	
A2C17	0160-0181	C:FXD MICA 30PF 5% 300VDCW	
A2C18	0140-0216	C:FXD MICA 120PF 2% 300VDCW	
A2C19	0150-0093	C:FXD CER 0.01UF +80-20% 100VDCW	
A2C20	0150-0093	C:FXD CER 0.01UF +80-20% 100VDCW	
A2C21	0180-0059	C:FXD ELECT 10UF -10%+100% 25VDCW	
A2CR1	1910-0016	DIODE:GERMANIUM	
A2CR2	1901-0040	DIODE:SILICON	
A2CR3	1901-0040	DIODE:SILICON	
A2CR4	1901-0040	DIODE:SILICON	
A2CR5	1901-0040	DIODE:SILICON	
A2CR6	1901-0040	DIODE:SILICON	
A2CR7	1901-0040	DIODE:SILICON	
A2CR8	1901-0040	DIODE:SILICON	
A2CR9	1901-0040	DIODE:SILICON	
A2CR10	1901-0040	DIODE:SILICON	
A2CR11	1901-0040	DIODE:SILICON	
A2CR12	1910-0016	DIODE:GERMANIUM	
A2CR13	1901-0040	DIODE:SILICON	
A2CR14	1910-0016	DIODE:GERMANIUM	
A2CR15	1901-0040	DIODE:SILICON	
A2CR16	1910-0016	DIODE:GERMANIUM	
A2CR17	1901-0040	DIODE:SILICON	
A2CR18	1901-0040	DIODE:SILICON	
A2L1	9140-0105	COIL:RF FXD 8.2UH	
A2L2	9140-0105	COIL:RF FXD 8.2UH	
A2Q1	1850-0062	TRANSISTOR:GERMANIUM PNP 2N404	
A2Q2	1850-0062	TRANSISTOR:GERMANIUM PNP 2N404	

See list of abbreviations in introduction to this section

Table 6-1. Reference Designation Index (Cont'd)

Reference Designation	Stock No.	Description #	Note
A2Q3	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A2Q4	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A2Q5	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A2Q6	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A2Q7	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A2Q8	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A2Q9	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A2Q10	1850-0062	TRANSISTOR:GERMANIUM PNP 2N404	
A2Q11	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A2Q12	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A2Q13	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A2Q14	1850-0062	TRANSISTOR:GERMANIUM PNP 2N404	
A2Q15	1851-0017	TRANSISTOR:2N1304	
A2Q16	1854-0003	TRANSISTOR:SILICON NPN 2N1711	
A2Q17	1851-0017	TRANSISTOR:2N1304	
A2R1	0683-3325	RIFXD COMP 3300 OHM 5% 1/4W	
A2R2	0683-1225	RIFXD COMP 1200 OHM 5% 1/4W	
A2R3	0683-1045	RIFXD COMP 100K OHM 5% 1/4W	
A2R4	0683-2225	RIFXD COMP 2.2K OHM 5% 1/4W	
A2R5	0683-2035	RIFXD COMP 20K OHM 5% 1/4W	
A2R6	0683-8235	RIFXD COMP 82K OHM 5% 1/4W	
A2R7	0683-5135	RIFXD COMP 51K OHM 5% 1/4W	
A2R8	0683-2225	RIFXD COMP 2.2K OHM 5% 1/4W	
A2R9	0683-2035	RIFXD COMP 20K OHM 5% 1/4W	
A2R10	0683-5135	RIFXD COMP 51K OHM 5% 1/4W	
A2R11	0683-2225	RIFXD COMP 2.2K OHM 5% 1/4W	
A2R12	0683-2035	RIFXD COMP 20K OHM 5% 1/4W	
A2R13	0683-5135	RIFXD COMP 51K OHM 5% 1/4W	
A2R14	0683-8235	RIFXD COMP 82K OHM 5% 1/4W	
A2R15	0683-2035	RIFXD COMP 20K OHM 5% 1/4W	
A2R16	0683-8235	RIFXD COMP 82K OHM 5% 1/4W	
A2R17	0683-5135	RIFXD COMP 51K OHM 5% 1/4W	
A2R18	0683-2225	RIFXD COMP 2.2K OHM 5% 1/4W	
A2R19	0683-2035	RIFXD COMP 20K OHM 5% 1/4W	
A2R20	0683-5135	RIFXD COMP 51K OHM 5% 1/4W	
A2R21	0683-2225	RIFXD COMP 2.2K OHM 5% 1/4W	
A2R22	0683-2035	RIFXD COMP 20K OHM 5% 1/4W	
A2R23	0683-5135	RIFXD COMP 51K OHM 5% 1/4W	
A2R24	0683-8235	RIFXD COMP 82K OHM 5% 1/4W	
A2R25	0683-2035	RIFXD COMP 20K OHM 5% 1/4W	
A2R26	0683-8235	RIFXD COMP 82K OHM 5% 1/4W	
A2R27	0683-5135	RIFXD COMP 51K OHM 5% 1/4W	
A2R28	0683-2225	RIFXD COMP 2.2K OHM 5% 1/4W	
A2R29	0683-2035	RIFXD COMP 20K OHM 5% 1/4W	
A2R30	0683-5135	RIFXD COMP 51K OHM 5% 1/4W	
A2R31	0683-2225	RIFXD COMP 2.2K OHM 5% 1/4W	
A2R32	0683-2035	RIFXD COMP 20K OHM 5% 1/4W	
A2R33	0683-5135	RIFXD COMP 51K OHM 5% 1/4W	
A2R34	0683-8235	RIFXD COMP 82K OHM 5% 1/4W	
A2R35	0683-2035	RIFXD COMP 20K OHM 5% 1/4W	
A2R36	0683-3315	RIFXD COMP 330 OHM 5% 1/4W	

See list of abbreviations in introduction to this section

Table 6-1. Reference Designation Index (Cont'd)

Reference Designation	Stock No.	Description #	Note
A2R37	0683-2725	RIFXD COMP 2700 OHM 5% 1/4W	
A2R38	0683-1025	RIFXD COMP 1000 OHM 5% 1/4W	
A2R39	0683-8235	RIFXD COMP 82K OHM 5% 1/4W	
A2R40	0683-2225	RIFXD COMP 2.2K OHM 5% 1/4W	
A2R41	0683-2035	RIFXD COMP 20K OHM 5% 1/4W	
A2R42	0683-5135	RIFXD COMP 51K OHM 5% 1/4W	
A2R43	0683-2225	RIFXD COMP 2.2K OHM 5% 1/4W	
A2R44	0683-2035	RIFXD COMP 20K OHM 5% 1/4W	
A2R45	0683-5135	RIFXD COMP 51K OHM 5% 1/4W	
A2R46	0683-4725	RIFXD COMP 4700 OHM 5% 1/4W	
A2R47	0683-8235	RIFXD COMP 82K OHM 5% 1/4W	
A2R48	0683-5135	RIFXD COMP 51K OHM 5% 1/4W	
A2R49	0683-1025	RIFXD COMP 1000 OHM 5% 1/4W	
A2R50	0683-3315	RIFXD COMP 330 OHM 5% 1/4W	
A2R51	0683-2725	RIFXD COMP 2700 OHM 5% 1/4W	
A2R52	0683-7505	RIFXD COMP 75 OHM 5% 1/4W	
A2R53	0683-3325	RIFXD COMP 3300 OHM 5% 1/4W	
A2R54	0683-3025	RIFXD COMP 3000 OHM 5% 1/4W	
A2R55	0757-0931	RIFXD MET FLM 2.0K OHM 2% 1/8W	
A2R56	0757-0945	RIFXD MET FLM 7.5K OHM 2% 1/8W	
J1	1250-0102	CONNECTOR:8NC FEMALE	
MP1	5262A-47A	SPACER	
MP2	5262A-47A	SPACER	
MP3	5262A-47A	SPACER	
MP4	5262A-47A	SPACER	
MP5	5262A-83A	GUIDE- PLUG IN	
MP6	05252-0001	PANEL	
MP7	05252-0002	CHASSIS	
MP8	05252-0003	COVER-BOARD	
P6	1251-0099	CONNECTOR:50 PIN MINAT	
R1	2100-0136	R:VAR COMP 6K OHM 10% LIN	
S1	3100-0891 0370-0077	SWITCH:ROTARY KNOB:BLK BAR W/ARROW 5/8 IN DIA 1/4 IN SHF	
XA1	1251-1176	CONNECTOR:PC 30 CONTACT	
XA2	1251-0135	CONNECTOR:PRINTED CIRCUIT 15 CONTACTS	

See list of abbreviations in introduction to this section

Table 6-2. Replaceable Parts

Stock No.	Description #	Mfr.	Mfr. Part No.	TQ
0140-0145	C:FXD MICA 22 PF 5% 500 VDCW	04062	RDM15C220J	4
0140-0216	C:FXD MICA 120PF 2% 300VDCW	04062	RDM15F121G3C	2
0150-0093	C:FXD CER 0.01UF +80-20% 100VDCW	91418	TA	14
0150-0121	C:FXD CER 0.1UF +80%-20% 50VDCW	56289	5C50A	5
0160-0181	C:FXD MICA 30PF 5% 300VDCW	14655	RDM15E300J3S	8
0160-0975	C:FXD CER 0.001 UF 20% 75VDCW	28480	0160-0975	23
0180-0059	C:FXD ELECT 10UF -10%+100% 25VDCW	56289	30D106G025B84	1
0370-0077	KNOB:BLK BAR W/ARROW 5/8 IN DIA 1/4 IN SHF	28480	0370-0077	1
0683-1015	R:FXD COMP 100 OHM 5% 1/4W	01121	CB-1015	1
0683-1025	R:FXD COMP 1000 OHM 5% 1/4W	01121	CB-1025	4
0683-1045	R:FXD COMP 100K OHM 5% 1/4W	01121	CB 1045	1
0683-1225	R:FXD COMP 1200 OHM 5% 1/4W	01121	CB 1225	2
0683-1325	R:FXD COMP 1300 OHM 5% 1/4W	01121	CB 1325	2
0683-1515	R:FXD COMP 150 OHM 5% 1/4W	01121	CB 1515	1
0683-1525	R:FXD COMP 1500 OHM 5% 1/4W	01121	CB 1525	2
0683-2015	R:FXD COMP 200 OHM 5% 1/4W	01121	CB 2015	1
0683-2025	R:FXD COMP 2000 OHM 5% 1/4W	01121	CB 2025	1
0683-2035	R:FXD COMP 20K OHM 5% 1/4W	01121	CB 2035	12
0683-2215	R:FXD COMP 220 OHM 5% 1/4W	01121	CB 2215	1
0683-2225	R:FXD COMP 2.2K OHM 5% 1/4W	01121	GB 2225	9
0683-2725	R:FXD COMP 2700 OHM 5% 1/4W	01121	CB-2725	2
0683-3025	R:FXD COMP 3000 OHM 5% 1/4W	01121	CB 3025	1
0683-3315	R:FXD COMP 330 OHM 5% 1/4W	01121	CB 3315	2
0683-3325	R:FXD COMP 3300 OHM 5% 1/4W	01121	CB 3325	2
0683-3625	R:FXD COMP 3600 OHM 5% 1/4W	01121	CB 3625	2
0683-4715	R:FXD COMP 470 OHM 5% 1/4W	01121	CB 4715	1
0683-4725	R:FXD COMP 4700 OHM 5% 1/4W	01121	CB 4725	1
0683-5105	R:FXD COMP 51 OHM 5% 1/4W	01121	CB-5105	2
0683-5135	R:FXD COMP 51K OHM 5% 1/4W	01121	CB 5135	12
0683-6215	R:FXD COMP 620 OHM 5% 1/4W	01121	CB 6215	2
0683-6225	R:FXD COMP 6200 OHM 5% 1/4W	01121	CB 6225	1
0683-6815	R:FXD COMP 680 OHM 5% 1/4W	01121	CB 6815	1
0683-7505	R:FXD COMP 75 OHM 5% 1/4W	01121	CB 7505	1
0683-7515	R:FXD COMP 750 OHM 5% 1/4W	01121	CB 7515	3
0683-7525	R:FXD COMP 7500 OHM 5% 1/4W	01121	CB 7525	1
0683-8215	R:FXD COMP 820 OHM 5% 1/4W	01121	CB 8215	4
0683-8235	R:FXD COMP 82K OHM 5% 1/4W	01121	EB 8235	8
0698-3113	R:FXD COMP 100 OHM 5% 1/8W	01121	BB-1015	1
0698-3374	R:FXD COMP 20 OHM 5% 1/8W	01121	BB-2205	1
0698-3375	R:FXD COMP 33 OHM 5% 1/8W	01121	BB-3305	1
0698-3376	R:FXD COMP 43 OHM 5% 1/8W	01121	BB-4305	1
0698-3378	R:FXD COMP 51 OHM 5% 1/8W	01121	BB-5105	5
0698-3379	R:FXD COMP 68 OHM 5% 1/8W	01121	BB-6805	1
0698-3380	R:FXD COMP 75 OHM 5% 1/8W	01121	BB-7505	1
0698-3381	R:FXD COMP 150 OHM 5% 1/8W	01121	BB-1515	3
0698-4130	R:FXD MET FLM 39 OHM	28480	0698-4130	2
0698-4131	R:FXD MET FLM 560 OHM	28480	0698-4131	1
0698-4132	R:FXD MET FLM 680 OHM	28480	0698-4132	1
0757-0923	R:FXD MET FLM 910 OHM 2% 1/8W	28480	0757-0923	9
0757-0931	R:FXD MET FLM 2.0K OHM 2% 1/8W	28480	0757-0931	1
0757-0945	R:FXD MET FLM 7.5K OHM 2% 1/8W	28480	0757-0945	1
0839-0021	THERMISTOR:DISC 500 OHM 10%	83186	25E11	1

See list of abbreviations in introduction to this section

Table 6-2. Replaceable Parts (Cont'd)

Stock No.	Description #	Mfr.	Mfr. Part No.	TQ
1250-0102	CONNECTOR:BNC FEMALE	91737	1250-0102	1
1251-0099	CONNECTOR:50 PIN MINAT	02660	57-10500-375	1
1251-0135	CONNECTOR:PRINTED CIRCUIT 15 CONTACTS	95354	SD-615UR	1
1251-1176	CONNECTOR:PC 30 CONTACT	95354	FD-630S	1
1850-0062	TRANSISTOR:GERMANIUM PNP 2N404	28480	1850-0062	4
1850-0066	TRANSISTOR:	28480	1850-0066	2
1850-0153	TRANSISTOR:PNP	28480	1850-0153	4
1851-0017	TRANSISTOR:2N1304	01295	2N1304	2
1853-0009	TRANSISTOR:SILICON PNP	28480	1853-0009	3
1853-0018	TRANSISTOR:SILICON PNP	28480	1853-0018	1
1854-0003	TRANSISTOR:SILICON NPN 2N1711	28480	1854-0003	1
1854-0005	TRANSISTOR:SILICON NPN 2N708	07263	2N708	12
1854-0019	TRANSISTOR:SILICON NPN	28480	1854-0019	4
1854-0031	TRANSISTOR:SILICON NPN 2N2865	93332	2N2865	4
1854-0048	TRANSISTOR:SILICON NPN 2N2857	02735	2N2857	6
1901-0040	DIODE:SILICON	28480	1901-0040	20
1901-0179	DIODE:SILICON	28480	1901-0179	4
1902-3079	DIODE:BREAKDOWN SILICON 4.35V 50%	28480	1902-3079	4
1910-0016	DIODE:GERMANIUM	28480	1910-0016	4
1912-0012	DIODE:TUNNEL GERMANIUM 10MA	28480	1912-0012	2
2100-0136	RIVAR COMP 6K OHM 10% LIN	28480	2100-0136	1
2100-0755	RIVAR WW 1000 OHM 5%	28480	2100-0755	1
3100-0891	SWITCH:ROTARY	28480	3100-0891	1
9100-0346	COIL:RF FXD 0.05UH 20%	78526	H-10886	1
9100-0368	COIL:RF FXD 0.33UH 10%	78526	1A-3303M	1
9140-0105	COIL:RF FXD 8.2UH	99800	1537-34	4
9170-0497	COIL:FXD RF 0.22UH 10%	99800	0BD	1
05252-0001	PANEL	28480	05252-0001	1
05252-0002	CHASSIS	28480	05252-0002	1
05252-0003	COVER-BOARD	28480	05252-0003	1
05252-2002	BOARD- ETCHED CIRCUIT	28480	05252-2002	1
05252-6001	PRESALER ASSY	28480	05252-6001	1
05252-6002	TIME BASE ASSY	28480	05252-6002	1
5262A-47A	SPACER	28480	5262A-47A	4
5262A-83A	GUIDE- PLUG IN	28480	5262A-83A	1

See list of abbreviations in introduction to this section

Table 6-3. Code List of Manufacturers

The following code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbooks H4-1 (Name to Code) and H4-2 (Code to Name) and their latest supplements. The date of revision and the date of the supplements used appear at the bottom of each page. Alphabetical codes have been arbitrarily assigned to suppliers not appearing in the H4 handbooks.

Code No.	Manufacturer	Address	Code No.	Manufacturer	Address	Code No.	Manufacturer	Address	Code No.	Manufacturer	Address
00000	U.S.A. Common	Any supplier of U.S.	07137	Transistor Electronics Corp.	Minneapolis, Minn.	20183	General Atomics Corp.	Philadelphia, Pa.	72825	Hugh H. Eby Inc.	Philadelphia, Pa.
00136	McCoy Electronics	Mount Holly Springs, Pa.	07138	Westinghouse Electric Corp.		21226	Executone, Inc.	New York, N.Y.	72928	Gudeman Co.	Chicago, Ill.
00213	Sage Electronics Corp.	Rochester, N.Y.		Electronic Tube Div.	Elmira, N.Y.	21520	Fansteel Metallurgical Corp.	No. Chicago, Ill.	72964	Robert M. Hadley Co.	Los Angeles, Calif.
00334	Humidial	Colton, Calif.	07119	Filmohm Corp.	New York, N.Y.	21335	The Fafnir Bearing Co.	New Britain, Conn.	72982	Erie Technological Products, Inc.	Erie, Pa.
00373	Garlock Inc.		07233	Cinch-Graphik Co.	City of Industry, Calif.	24455	G.E. Lamp Division		73061	Hansen Mfg. Co., Inc.	Pinceton, Ind.
	Electronics Products Div.	Camden, N.J.	07261	Avnet Corp.	Los Angeles, Calif.			Nela Park, Cleveland, Ohio	73076	H.M. Harper Co.	Chicago, Ill.
00656	Aerovox Corp.	New Bedford, Mass.	07263	Fairchild Camera & Inst. Corp.		24655	General Radio Co.	West Concord, Mass.	73138	Helipot Div. of Beckman Inst., Inc.	Fullerton, Calif.
00779	Amp. Inc.	Harrisburg, Pa.		Semiconductor Div.	Mountain View, Calif.	26365	Gries Reproducer Corp.	New Rochelle, N.Y.			
00781	Aircraft Radio Corp.	Boonton, N.J.	07322	Minnesota Rubber Co.	Minneapolis, Minn.	26462	Grobet File Co. of America, Inc.				
00815	Northern Engineering Laboratories, Inc.	Burlington, Wis.	07387	The Birtcher Corp.	Los Angeles, Calif.			Carlstadt, N.J.	73293	Hughes Products Division of	Newport Beach, Calif.
			07700	Technical Wire Products Inc.	Cranford, N.J.	26992	Hamilton Watch Co.	Palo Alto, Calif.	73445	Amperex Electronic Co., Div. of North	Hicksville, N.Y.
00853	Sangamo Electric Co.,	Pickens, S.C.	07910	Continental Device Corp.	Hawthorne, Calif.	28480	Hewlett-Packard Co.	Owensboro, Ky.	73506	Bradley Semiconductor Corp.	Hamden, Conn.
	Pickens Div.		07933	Raytheon Mfg. Co.,	Mountain View, Calif.	33173	G.E. Receiving Tube Dept.	Chicago, Ill.	73559	Carling Electric, Inc.	Hartford, Conn.
00866	Goe Engineering Co.	Los Angeles, Calif.	07966	Shockley Semi-Conductor		35434	Lectron Inc.		73682	George K. Garrett Co., Div.	Philadelphia, Pa.
00891	Carl E. Holmes Corp.	Los Angeles, Calif.		Laboratories	Palo Alto, Calif.	36196	Stanwack Coil Products Ltd.	Hawkesbury, Ontario, Canada		MSL Industries Inc.	Chicago, Ill.
01121	Allen Bradley Co.	Milwaukee, Wis.	07980	Boonton Radio Corp.	Rockaway, N.J.	37942	P.R. Mallory & Co., Inc.	Indianapolis, Ind.	73734	Federal Screw Products Inc.	Chicago, Ill.
01255	Litton Industries, Inc.	Beverly Hills, Calif.	08145	U.S. Engineering Co.	Los Angeles, Calif.	39543	Mechanical Industries Prod. Co.	Akron, Ohio	73743	Fischer Special Mfg. Co.	Cincinnati, Ohio
01281	TRW Semiconductors, Inc.	Lawndale, Calif.	08289	Blinn, Delbert, Co.	Pomona, Calif.	40920	Miniature Precision Bearings, Inc.	Keene, N.H.	73793	The General Industries Co.	Elyria, Ohio
01295	Texas Instruments, Inc.		08358	Burgess Battery Co.	Niagara Falls, Ontario, Canada	42190	Muler Co.	Chicago, Ill.	73846	Goshen Stamping & Tool Co.	Goshen, Ind.
	Transistor Products Div.	Dallas, Texas		The Bristol Co.	Waterbury, Conn.	43990	C.A. Norgren Co.	Englewood, Colo.	73899	J.F.D. Electronics Corp.	Brooklyn, N.Y.
01349	The Alliance Mfg. Co.	Alliance, Ohio	08664	Sloan Company	Sun Valley, Calif.	44655	Ohmite Mfg. Co.	Skoie, Ill.	73905	Jennings Radio Mfg. Corp.	San Jose, Calif.
01589	Pacific Relays, Inc.	Van Nuys, Calif.	08717	ITT Cannon Electric Inc.,	Phoenix Div.	47904	Polaroid Corp.	Cambridge, Mass.	74276	Signalite Inc.	Neptune, N.J.
01930	Amperock Corp.	Rockford, Ill.	08718		Phoenix, Arizona	48620	Precision Thermometer & Inst. Co.	Southampton, Pa.	74455	J.H. Winnis and Sons	Winchester, Mass.
01961	Pulse Engineering Co.	Santa Clara, Calif.	08792	CBS Electronics Semiconductor		49566	Raytheon Company	Lexington, Mass.	74861	Industrial Condenser Corp.	Chicago, Ill.
02114	Ferroxcube Corp. of America	Saugerties, N.Y.		Operations, Div. of C.B.S., Inc.	Lowell, Mass.	50200	Rowan Controllor Co.	Westminster, Md.	74868	R.F. Products Division of Amphenol-	Danbury, Conn.
02286	Cole Rubber and Plastics Inc.	Palo Alto, Calif.	08984	Mel-Ram	Indianapolis, Ind.	52983	Sanborn Co.	Waltham, Mass.		Borg Electronics Corp.	
02660	Amphenol-Borg Electronics Corp.	Chicago, Ill.	09026	Babcock Relays Div.	Costa Mesa, Calif.	54294	Shallcross Mfg. Co.	Selma, N.C.	74970	E.F. Johnson Co.	Waseca, Minn.
02735	Radio Corp. of America, Semiconductor		09134	Texas Capacitor Co.	Houston, Texas	55026	Simpson Electric Co.	Chicago, Ill.	75042	International Resistance Co.	Philadelphia, Pa.
	Materials Div.	Somerville, N.J.	09145	Atohn Electronics	Sun Valley, Calif.	55933	Sonotone Corp.	Elmsford, N.Y.	75378	James Knights Co.	Sandwich, Ill.
02771	Vocaline Co. of America, Inc.		09250	Electro Assemblies, Inc.	Chicago, Ill.	55938	Raytheon Co. Commercial Apparatus &		75382	Kulka Electric Corporation	Mt. Vernon, N.Y.
		Old Saybrook, Conn.	09569	Mallory Battery Co. of	Canada, Ltd.		Systems Div.	So. Norwalk, Conn.	75818	Lenz Electric Mfg. Co.	Chicago, Ill.
02777	Hopkins Engineering Co.	San Fernando, Calif.	10214	General Transistor Western Corp.	Toronto, Ontario, Canada	56137	Spaulding Fibre Co., Inc.	Tonawanda, N.Y.	75915	Littlefuse, Inc.	Des Plaines, Ill.
03508	G.E. Semiconductor Prod. Dept.	Syracuse, N.Y.	10411	Ti-Tal, Inc.	Berkeley, Calif.	56289	Sprague Electric Co.	North Adams, Mass.	76005	Lord Mfg. Co.	Erie, Pa.
03705	Apex Machine & Tool Co.	Dayton, Ohio	10646	Carborundum Co.	Niagara Falls, N.Y.	58446	Telex, Inc.	Elizabeth, N.J.	76210	C.W. Marwedel	San Francisco, Calif.
03797	Eldema Corp.	Compton, Calif.	11236	CATS of Berne, Inc.	Berne, Ind.	59730	Thomas & Betts Co.	Bluffton, Ohio	76233	General Instrument Corp.	Newark, N.J.
03877	Transitron Electric Corp.	Wakefield, Mass.	11237	Chicago Telephone of California, Inc.	So. Pasadena, Calif.	60741	Triplett Electrical Inst. Co.	Pittsburgh, Pa.	76487	James Millen Mfg. Co., Inc.	Malden, Mass.
03888	Pyrofilm Resistor Co., Inc.	Cedar Knolls, N.J.	11242	Bay State Electronics Corp.	Waltham, Mass.	61775	Westinghouse Air Brake Co.	Owosso, Mich.	76493	J.W. Miller Co.	Los Angeles, Calif.
03954	Singer Co., Diehl Div.,	Finderne Plant	11312	Microwave Electronics Corp.	Palo Alto, Calif.	62119	Universal Electric Co.	Mt. Vernon, N.Y.	76530	Ponaddock Mills	San Leandro, Calif.
		Somerville, N.J.	11313	Duncan Electronics Inc.	Costa Mesa, Calif.	64959	Western Electric Co., Inc.	New York, N.Y.	76545	Mueller Electric Co.	Cleveland, Ohio
04009	Arrow, Hart and Hegeman Elect. Co.	Hartford, Conn.	11514	General Instrument Corp., Semiconductor Div.,	Newark, N.J.	65092	Weston Inst. Div. of Daystrom, Inc.	Chicago, Ill.	76854	Oak Manufacturing Co.	Crystal Lake, Ill.
			11717	Imperial Electronic, Inc.	Buena Park, Calif.	66295	Wittek Mfg. Co.	Newark, N.J.	77068	The Bendix Corp.	
04013	Taurus Corp.	Lambertville, N.J.	11870	Melabs, Inc.	Palo Alto, Calif.	66346	Revere Wollansak Div. Minn. Mining &			Bendix Pacific Div.	No. Hollywood, Calif.
04062	Elmenco Products Co.	New York, N.Y.	12136	Philadelphia Handle Co.	Camden, N.J.		Mfg. Co.	St. Paul, Minn.	77075	Pacific Metals Co.	San Francisco, Calif.
04222	H-Q Division of Aerovox	Myrtle Beach, S.C.	12697	Claostat Mfg. Co.	Dover, N.H.	70276	Allen Mfg. Co.	Hartford, Conn.	77221	Phanotron Instrument and	South Pasadena, Calif.
04354	Precision Paper Tube Co.	Chicago, Ill.	12859	Nippon Electric Co., Ltd.	Tokyo, Japan	70309	Allen Mfg. Co.	Hartford, Conn.		Electronic Co.	
04404	Dynec Division of Hewlett-Packard Co.	Palo Alto, Calif.	12881	Metex Electronics Corp.	Clark, N.J.	70318	Allmetal Screw Product Co. Inc.	Garden City, N.Y.	77342	Philadelphia Steel and Wire Corp.	Philadelphia, Pa.
			12930	Delta Semiconductor Inc.	Newport Beach, Calif.					Potter & Brumfield Div.	Princeton, Ind.
04651	Sylvania Electric Products,	Mountain View, Calif.	13103	Thermolloy	Dallas, Texas	70485	Atlantic India Rubber Works, Inc.	Chicago, Ill.	77630	TRW Electronic Components Div.	Camden, N.J.
	Microwave Device Div.		13396	Telefunken (G.M.B.H.)	Hanover, Germany	70563	Amperic Co., Inc.	Union City, N.J.	77638	General Instrument Corp., Rectifier Div.	Brooklyn, N.Y.
04713	Motorola, Inc., Semiconductor Prod. Div.	Phoenix, Arizona	13835	Midland-Wright Div. of Pacific Industries, Inc.	Kansas City, Kansas	70903	Belden Mfg. Co.	Chicago, Ill.	77764	Resistance Products Co.	Harrisburg, Pa.
					Newbury Park, Calif.	70998	Bird Electronic Corp.	Cleveland, Ohio	77969	Rubbercraft Corp. of Calif.	Torrance, Calif.
04732	Friton Co., Inc., Western Div.	Culver City, Calif.	14099	Sem-Tech	San Jose, Calif.	71002	Burnbach Radio Co.	New York, N.Y.	78189	Shakeproof Division of Illinois	
04773	Automatic Electric Co.	Northlake, Ill.	14193	Calif. Resistor Corp.	Santa Monica, Calif.	71041	Boston Gear Works Div. of			Tool Works	Elgin, Ill.
04796	Sequoia Wire Co.	Redwood City, Calif.	14298	American Components, Inc.	Conshohocken, Pa.		Murray Co. of Texas	Quincy, Mass.	78283	Signal Indicator Corp.	New York, N.Y.
04811	Precision Coil Spring Co.	El Monte, Calif.	14493	Hewlett-Packard Company	Loveland, Colo.	71218	Bud Radio, Inc.	Willoughby, Ohio	78290	Sluthers-Dunn Inc.	Pittman, N.J.
04870	P.M. Motor Company	Westchester, Ill.	14655	Cornell Dublier Electric Corp.	Newark, N.J.	71286	Camloc Fastener Corp.	Paramus, N.J.	78452	Thompson-Bremer & Co.	Chicago, Ill.
05006	Twentieth Century Plastics, Inc.	Los Angeles, Calif.	14960	Williams Mfg. Co.	San Jose, Calif.	71313	Cardwell Condenser Corp.	Lindenhurst L.I., N.Y.	78471	Tilley Mfg. Co.	San Francisco, Calif.
			15203	Webster Electronics Co.	New York, N.Y.	71400	Bussmann Mfg. Div. of		78488	Stackpole Carbon Co.	St. Marys, Pa.
05277	Westinghouse Electric Corp.	Youngwood, Pa.	15291	Adjustable Bushing Co.	N.Hollywood, Calif.		McGraw-Edison Co.	St. Louis, Mo.	78493	Standard Thomson Corp.	Waltham, Mass.
	Semiconductor Dept.		15558	Micron Electronics	Garden City, Long Island, N.Y.	71436	Chicago Condenser Corp.	Chicago, Ill.	78553	Tinnerman Products, Inc.	Cleveland, Ohio
05347	Ultrinox, Inc.	San Mateo, Calif.	15772	Twentieth Century		71447	Calif. Spring Co., Inc.	Picco-Rivera, Calif.	78790	Transformer Engineers	San Gabriel, Calif.
05593	Illumitronic Engineering Co.	Sunnyvale, Calif.	15818	Amelco Inc.	Mt. View, Calif.	71450	CTS Corp.	Elkhart, Ind.	78947	Ucinite Co.	Newtonville, Mass.
05616	Isco Plastic		15909	Daven Div. Thomas A. Edison Ind.		71468	ITT Cannon Electric Inc.	Los Angeles, Calif.	79136	Waltes Kohmhor Inc.	Long Island City, N.Y.
	(o o Electrical Spec. Co.)	Cleveland, Ohio				71471	Cinema Engineering Co.	Burbank, Calif.	79142	Veeder Root, Inc.	Hartford, Conn.
05624	Barber Colman Co.	Rockford, Ill.	16037	McGraw-Edison Co.	Long Island City, N.Y.	71482	C.P. Clare & Co.	Chicago, Ill.	79251	Wenco Mfg. Co.	Chicago, Ill.
05728	Tiffen Optical Co.		16352	Computer Diode Corp.	Lodi, N.J.	71590	Centralab Div. of Globe Union Inc.		79727	Continental-Wirt Electronics Corp.	Philadelphia, Pa.
	Roslyn Heights	Long Island, N.Y.	16688	Ideal Prec. Meter Co., Inc.	Brooklyn, N.Y.			Milwaukee, Wis.			
05729	Metro-Tel Corp.	Plainview, N.Y.	16758	Delco Radio Div. of G.M. Corp.	Kokomo, Ind.	71616	Commercial Plastics Co.	Chicago, Ill.	79963	Zierick Mfg. Corp.	New Rochelle, N.Y.
05783	Stewart Engineering Co.	Santa Cruz, Calif.	17109	Thermonetics Inc.	Canoga Park, Calif.	71700	The Cornish Wire Co.	New York, N.Y.	80031	Mepco Division of Sessions	Morristown, N.J.
05820	Wakefield Engineering Inc.	Wakefield, Mass.	17474	Tranex Company	Mountain View, Calif.	71744	Chicago Miniature Lamp Works	Chicago, Ill.	80120	Schnitzer Alloy Products Co.	Elizabeth, N.J.
06004	The Bassick Co.	Bridgeport, Conn.	18476	Ty-Car Mfg. Co., Inc.	Holliston, Mass.	71753	A.O. Smith Corp., Crowley Div.	West Orange, N.J.	80130	Times Telephoto Equipment	New York, N.Y.
06175	Bausch and Lomb Optical Co.	Rochester, N.Y.	18486	Radio Industries	Des Plaines, Ill.	71785	Cinch Mfg. Co., Howard B. Jones Div.	Chicago, Ill.	80131	Electronic Industries Association. Any brand	
06402	E.T.A. Products Co. of America	Chicago, Ill.	18583	Curtis Instrument, Inc.	Mt. Kisco, N.Y.			Midland, Mich.		Tube meeting EIA standards-Washington, D.C.	
06475	Western Devices Inc.	Burbank, Calif.	18873	E.I. DuPont & Co., Inc.	Wilmington, Del.	71984	Dow Corning Corp.	Midland, Mich.	80207	Unimax Switch, Div. Maxon	Wallingford, Conn.
06540	Anatom Electronic Hardware Co., Inc.	New Rochelle, N.Y.	19315	The Bendix Corp.,	Teterboro, N.J.	72136	Electro Motive Mfg. Co., Inc.	Willimantic, Conn.		Electronics Corp.	
				Eclipse-Pioneer Div.		71707	Coto Coil Co., Inc.	Providence, R.I.	80223	United Transformer Corp.	New York, N.Y.
06555	Beede Electrical Instrument Co., Inc.	Penacook, N.H.	19500	Thomas A. Edison Industries,		72354	John E. Fast Co., Div. Victoreen Instr. Co.	Chicago, Ill.	80248	Oxford Electric Corp.	Chicago, Ill.
				Div. of McGraw-Edison Co.	West Orange, N.J.			Brooklyn, N.Y.	80294	Bourns Laboratories, Inc.	Riverside, Calif.
06666	General Devices Co., Inc.	Indianapolis, Ind.	19701	Electra Mfg. Co.	Independence, Kansas	72619	Dialight Corp.	Brooklyn, N.Y.	80411	Robertshaw Controls Co.	Hillsboro, Ohio
06751	Nuclear Corp. of America	Phoenix, Ariz.				72656	Indiana General Corp., Electronics Div.	Kearby, N.J.	80486	All Star Products Inc.	Defiance, Ohio
	U.S. Sencor Div.					72765	Drake Mfg. Co.	Chicago, Ill.	80509	Avery Adhesive Label Corp.	Monrovia, Calif.
06812	Torrington Mfg. Co., West Div.	Van Nuys, Calif.									
06980	Eitel-McCullough Inc.	San Carlos, Calif.									
07088	Kelvin Electric Co.	Van Nuys, Calif.									
07115	Corning Glass Works										
	Electronic Components Dept.	Bradford, Pa.									
07126	Digitran Co.	Pasadena, Calif.									

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Table 6-3. Code List of Manufacturers (Cont'd)

Code No.	Manufacturer	Address	Code No.	Manufacturer	Address	Code No.	Manufacturer	Address	Code No.	Manufacturer	Address
80583	Hammarlund Co., Inc.	New York, N.Y.	83821	Loyd Scruggs Co.	Festus, Mo.	93369	Robbins and Myers, Inc.	New York, N.Y.	98731	General Mills Inc.,	
80640	Stevens, Arnold, Co., Inc.	Boston, Mass.	84171	Arco Electronics Inc.	Great Neck, N.Y.	93410	Stevens Mfg. Co., Inc.	Mansfield, Ohio		Electronics Div.	Minneapolis, Minn.
81030	International Instruments Inc.	Orange, Conn.	84396	A.J. Glesener Co., Inc.	San Francisco, Calif.	93788	Howard J. Smith Inc.	Port Monmouth, N.J.	98821	North Hills Electronics, Inc.	Glen Cove, N.Y.
81073	Grayhill Co.	LaGrange, Ill.	84411	TRW Capacitor Div.	Ogallala, Neb.	93929	G.V. Controls	Livingston, N.J.	98925	Semiconductor Div. of Clevite Corp.	Waltham, Mass.
81095	Triad Transformer Corp.	Venice, Calif.	84970	Sarkes Tarzian, Inc.	Bloomington, Ind.	94137	General Cable Corp.	Bayonne, N.J.			
81312	Winchester Electronics Co., Inc.	Norwalk, Calif.	85454	Boonton Molding Company	Boonton, N.J.	94144	Raytheon Co., Comp. Div.,	Quincy, Mass.	98978	International Electronic	
81349	Military Specification		85471	A.B. Boyd Co.	San Francisco, Calif.		Ind. Comp. Operations			Research Corp.	Burbank, Calif.
81415	Wilkor Products, Inc.	Cleveland, Ohio	85474	R.M. Bracamonte & Co.	San Francisco, Calif.	94148	Scientific Electronics Products, Inc.	Loveland, Colo.	99109	Columbia Technical Corp.	New York, N.Y.
81483	International Rectifier Corp.	El Segundo, Calif.	85660	Koiled Kords, Inc.	Hamden, Conn.				99313	Varian Associates	Palo Alto, Calif.
81541	The Airpax Products Co.	Cambridge, Mass.	85911	Seamless Rubber Co.	Chicago, Ill.	94154	Tung-Sol Electric, Inc.	Newark, N.J.	99515	Marshall Ind. Elect. Products Div.	San Marino, Calif.
81860	Barry Controls, Div. Barry Wright Corp.	Watertown, Mass.	86197	Clifton Precision Products Co., Inc.	Clifton Heights, Pa.	94197	Curtiss-Wright Corp.	East Paterson, N.J.	99707	Control Switch Division, Controls Co.	El Segundo, Calif.
82042	Carter Precision Electric Co.	Skokie, Ill.	86579	Precision Rubber Products Corp.	Dayton, Ohio	94272	South Chester Corp.	Chester, Pa.	99800	Delevan Electronics Corp.	East Aurora, N.Y.
82047	Sperli Faraday Inc., Cooper Hewitt	Hoboken, N.J.	86684	Radio Corp. of America, Electronic	Harrison, N.J.	94310	Tru-Ohm Products	Huntington, Ind.	99848	Wilco Corporation	Indianapolis, Ind.
82142	Jeffers Electronics Division of		87216	Philco Corporation (Lansdale Division)	Lansdale, Pa.	94330	Wire Cloth Products, Inc.	Bellwood, Ill.	99934	Renbrandt, Inc.	Boston, Mass.
82170	Speer Carbon Co.	Du Bois, Pa.	87473	Western Fibrous Glass Products Co.	San Francisco, Calif.	94682	Worcester Pressed Aluminum Corp.	Worcester, Mass.	99942	Hoffman Electronics Corp.	El Monte, Calif.
82209	Maguire Industries, Inc.	Greenwich, Conn.	87664	Van Waters & Rogers Inc.	San Francisco, Calif.	95023	George A. Philbrick Researchers, Inc.	Boston, Mass.	99957	Semiconductor Div.	
82219	Sylvania Electric Prod. Inc.	Emporium, Pa.	87930	Tower Mfg. Corp.	Providence, R.I.					Technology Instrument Corp.	Newbury Park, Calif.
82376	Astron Division, Renwell Industries Inc.	East Newark, N.J.	88140	Cutler-Hammer, Inc.	Lincoln, Ill.	95236	Allies Products Corp.	Miami, Fla.			
82389	Switchcraft, Inc.	Chicago, Ill.	88220	Gould-National Batteries, Inc.	St. Paul, Minn.	95238	Confidential Connector Corp.	Woodside, N.Y.			
82647	Metals & Controls Inc.	Attleboro, Mass.	88421	Federal Telephone & Radio Corp.	Clifton, N.J.	95263	Leecraft Mfg. Co., Inc.	Long Island, N.Y.			
82768	Phillips-Advance Control Co.	Joliet, Ill.	88698	General Mills, Inc.	Buffalo, N.Y.	95264	Lerco Electronics, Inc.	Burbank, Calif.			
82866	Research Products Corp.	Madison, Wis.	89231	Graybar Electric Co.	Oakland, Calif.	95265	National Coil Co.	Sheridan, Wyo.			
82877	Rotron Mfg. Co., Inc.	Woodstock, N.Y.	89473	General Electric Distributing Corp.	Schenectady, N.Y.	95275	Viframon, Inc.	Bridgeport, Conn.			
82893	Vector Electronic Co.	Glendale, Calif.	89665	United Transformer Co.	Chicago, Ill.	95348	Gordos Corp.	Bloomfield, N.J.			
83053	Western Washer Mfg. Co.	Los Angeles, Calif.	90179	US Rubber Co., Consumer Ind. & Plastics	Passaic, N.J.	95354	Methode Mfg. Co.	Chicago, Ill.			
83058	Carr Fastener Co.	Cambridge, Mass.	90970	Bearing Engineering Co.	San Francisco, Calif.	95712	Dage Electric Co., Inc.	Franklin, Ind.			
83086	New Hampshire Ball Bearing, Inc.	Peterborough, N.H.	91260	Connor Spring Mfg. Co.	San Francisco, Calif.	95987	Weckesser Co.	Chicago, Ill.			
83125	General Instrument Corp.,		91345	Miller Dial & Nameplate Co.	El Monte, Calif.	96067	Huggins Laboratories	Sunnyvale, Calif.			
83148	ITT Wire and Cable Div.	Los Angeles, Calif.	91418	Radio Materials Co.	Chicago, Ill.	96095	Hi-Q Div. of Aerovox Corp.	Olean, N.Y.			
83186	Victory Engineering Corp.	Springfield, N.J.	91506	Augat Inc.	Attleboro, Mass.	96256	Thordarson-Meissner Div. of	Mt. Carmel, Ill.			
83298	Bendix Corp., Red Bank Div.	Red Bank, N.J.	91637	Dale Electronics, Inc.	Columbus, Nebr.	96296	Solar Manufacturing Co.	Los Angeles, Calif.	0000F	Malco Tool and Die	Los Angeles, Calif.
83315	Hubbell Corp.	Mundelein, Ill.	91662	Elco Corp.	Willow Grove, Pa.	96330	Carlton Screw Co.	Chicago, Ill.	0000M	Western Coil Div. of Automatic	Redwood City, Calif.
83330	Smith, Herman H., Inc.	Brooklyn, N.Y.	91737	Gremar Mfg. Co., Inc.	Wakefield, Mass.	96341	Microwave Associates, Inc.	Burlington, Mass.	0000Z	Willow Leather Products Corp.	Newark, N.J.
83385	Central Screw Co.	Chicago, Ill.	91827	K F Development Co.	Redwood City, Calif.	96501	Excel Transformer Co.	Oakland, Calif.	000AA	British Radio Electronics Ltd.	Washington, D.C.
83501	Gavitt Wire and Cable Co.	Brookfield, Mass.	91929	Honeywell Inc., Micro Switch Div.	Freeport, Ill.	97464	Industrial Retaining Ring Co.	Irvine, N.J.			
83594	Burroughs Corp.	Plainfield, N.J.	91961	Nahm-Bros. Spring Co.	Oakland, Calif.	97539	Automatic & Precision Mfg.	Englewood, N.J.	000AB	ETA	England
83740	Eveready Div. National Carbon	New York, N.Y.	92180	Tru-Connector Corp.	Peabody, Mass.	97979	Reon Resistor Corp.	Yonkers, N.Y.	000AK	Siemens-America	White Plains, N.Y.
83777	Model Eng. and Mfg., Inc.	Huntington, Ind.	92367	Elgeet Optical Co., Inc.	Rochester, N.Y.	97983	Lifton System Inc., Adler-Westric	New Rochelle, N.Y.	000BB	Precision Instrument	
			92196	Universal Industries, Inc.	City of Industry, Calif.		Commun. Div.			Components Co.	Van Nuys, Calif.
			92607	Tensolite Insulated Wire Co., Inc.	Tarrytown, N.Y.	98141	R-Tronics, Inc.	Jamaica, N.Y.	000MM	Rubber Eng. & Development	Hayward, Calif.
			93332	Sylvania Electric Prod. Inc.	Woburn, Mass.	98159	Rubber Teck, Inc.	Gardena, Calif.	000NN	A "N" D Mfg. Co.	San Jose, Calif.
				Semiconductor Div.		98220	Francis L. Moseley	Pasadena, Calif.	000QQ	Cooltron	Oakland, Calif.
						98278	Microdot, Inc.	So. Pasadena, Calif.	000SS	Control of Elgin Watch Co.	Burbank, Calif.
						98291	Sealectro Corp.	Mamaroneck, N.Y.	000WW	California Eastern Lab.	Burlington, Calif.
						98405	Carad Corp.	Redwood City, Calif.	000YY	S.K. Smith Co.	Los Angeles, Calif.

THE FOLLOWING H-P VENDORS HAVE NO NUMBER ASSIGNED IN THE LATEST SUPPLEMENT TO THE FEDERAL SUPPLY CODE FOR MANUFACTURERS HANDBOOK.

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Hewlett-Packard
Southern Sales Division
Holiday Office Ctr., Suite 18
(205) 881-4591
TWX: 510-579-2204

ARIZONA

Scottsdale, 85251
Hewlett-Packard
Neely Sales Division
3009 No. Scottsdale Rd.
(602) 945-7601
TWX: 602-949-0111

Tucson, 85716
Hewlett-Packard
Neely Sales Division
232 So. Tucson Blvd.
(602) 623-2564
TWX: 602-792-2759

CALIFORNIA

Los Angeles Area
Hewlett-Packard
Neely Sales Division
3939 Lankershim Blvd.
North Hollywood 91604
(213) 877-1282 and 766-3811
TWX: 910-499-2170

Sacramento, 95821
Hewlett-Packard
Neely Sales Division
2591 Carlsbad Ave.
(916) 482-1463
TWX: 916-444-8683

San Diego, 92106
Hewlett-Packard
Neely Sales Division
1055 Shafter Street
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TWX: 714-276-4263

San Francisco Area
Hewlett-Packard
Neely Sales Division
1101 Embarcadero Rd.
Palo Alto 94303
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TWX: 910-373-1280

COLORADO

Englewood, 80110
Hewlett-Packard
Neely Sales Division
7965 East Prentice
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TWX: 303-771-3056

CONNECTICUT

Middletown, 06458
Hewlett-Packard
Yewell Sales Division
589 Saybrook Rd.
(203) 346-6611
TWX: 710-428-2036

FLORIDA

Miami, 33125
Hewlett-Packard
Florida Sales Division
2907 Northwest 7th St.
(305) 635-6461

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Hewlett-Packard
Florida Sales Division
621 Commonwealth Ave.
(305) 425-5541
TWX: 305-275-1234

St. Petersburg, 33708
Hewlett-Packard
Florida Sales Division
410-150th Ave., Madeira Beach
(813) 391-0211
TWX: 813-391-0666

GEORGIA

Atlanta, 30305
Hewlett-Packard
Southern Sales Division
3110 Maple Drive, N. E.
(404) 233-1141
TWX: 810-751-3283

ILLINOIS

Chicago, 60645
Hewlett-Packard
Crossley Sales Division
2501 West Peterson Ave.
(312) 275-1600
TWX: 910-221-0277

INDIANA

Indianapolis, 46205
Hewlett-Packard
Crossley Sales Division
3919 Meadows Dr.
(317) 546-4891
TWX: 317-635-4300

KENTUCKY

Louisville, 40218
Hewlett-Packard
Southern Sales Division
Suite 4, 3411 Bardstown Rd.
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TWX: 810-535-3128

MARYLAND

Baltimore, 21207
Hewlett-Packard
Horman Sales Division
6660 Security Blvd.
(301) 944-5400

Washington, D. C. Area
Hewlett-Packard
Horman Sales Division
941 Rollins Avenue
Rockville 20852
(301) 427-7560
TWX: 710-828-9684

MASSACHUSETTS

Boston Area
Hewlett-Packard
Yewell Sales Division
Middlesex Turnpike
Burlington 01804
(617) 272-9000
TWX: 710-332-0382

MICHIGAN

Detroit, 48235
Hewlett-Packard
Crossley Sales Division
14425 West Eight Mile Road
(313) 342-5700
TWX: 313-342-0702

MINNESOTA

St. Paul, 55114
Hewlett-Packard
Crossley Sales Division
842 Raymond Avenue
(612) 646-7881
TWX: 910-563-3734

MISSOURI

Kansas City, 64131
Harris-Hanson Company
7916 Paseo Street
(816) 444-9494
TWX: 816-556-2423

St. Louis, 63144
Harris-Hanson Company
2814 South Brentwood Blvd.
(314) 647-4350
TWX: 314-962-3933

NEW JERSEY

Asbury Park Area
Hewlett-Packard
Robinson Sales Division
Shrewsbury
(201) 747-1060

Englewood, 07631
Hewlett-Packard
RMC Sales Division
391 Grand Avenue
(201) 567-3933

NEW MEXICO

Albuquerque, 87108
Hewlett-Packard
Neely Sales Division
6501 Lomas Blvd., N. E.
(505) 255-5586
TWX: 910-989-1665

Las Cruces, 88001
Hewlett-Packard
Neely Sales Division
114 S. Water Street
(505) 526-2486
TWX: 505-524-2671

NEW YORK

New York, 10021
Hewlett-Packard
RMC Sales Division
236 East 75th Street
(212) 879-2023
TWX: 710-581-4376

Rochester, 14625
Hewlett-Packard
Syracuse Sales Division
800 Linden Avenue
(716) 381-4120
TWX: 716-221-1514

Poughkeepsie, 12601
Hewlett-Packard
Syracuse Sales Division
82 Washington St.
(914) 454-7330
TWX: 914-452-7425

Syracuse, 13211
Hewlett-Packard
Syracuse Sales Division
5858 East Molloy Rd.
(315) 454-2486
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NORTH CAROLINA

High Point, 27262
Hewlett-Packard
Southern Sales Division
1923 N. Main Street
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OHIO

Cleveland, 44129
Hewlett-Packard
Crossley Sales Division
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TWX: 216-888-0715

Dayton, 45409
Hewlett-Packard
Crossley Sales Division
1250 W. Dorothy Lane
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PENNSYLVANIA

Camp Hill
Hewlett-Packard
Robinson Sales Division
(717) 737-6791

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Hewlett-Packard
Robinson Sales Division
144 Elizabeth Street
West Conshohocken 19428
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Hewlett-Packard
Crossley Sales Division
2545 Moss Side Blvd.
Monroeville 15146
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TWX: 710-797-3650

TEXAS

Dallas, 75209
Hewlett-Packard
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P.O. Box 7166, 3605 Inwood Rd.
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Houston, 77027
Hewlett-Packard
Southwest Sales Division
P.O. Box 22813, 4242 Richmond Ave.
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UTAH

Salt Lake City, 84115
Hewlett-Packard
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1482 Major St.
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TWX: 801-521-2604

VIRGINIA

Richmond, 23230
Hewlett-Packard
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2112 Spencer Road
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WASHINGTON

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11656 N. E. 8th St.
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